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Original Research Article

Ambulatory oral surgeries are safe procedures for medically compromised older people patients: a retrospective study

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Abstract – Background: Ageing, medical compromission and drug therapies are the main factors that can reduce the ability to cope with stress. The present study aimed to determine the incidence of medical emergencies and post-surgical complications in medically compromised elderly patients treated surgically in an ambulatory setting. **Materials and methods:** A sample of 199 patients surgically treated with tooth extractions and other dental surgeries was retrospectively analyzed. All patient-related and surgery-related variables were considered as predictive variables. Systemic complications (*e.g.*, Digita qui il testo, diabetic), as well as local complications (*e.g.*, post-operative bleeding, dehiscence), were evaluated as study outcomes. A univariate analysis was performed to identify the association between intra- and post-operative complications and all the study variables. **Results:** No medical emergencies and intraoperative complications occurred. The incidence of loco-regional post-operative complications was approximately 5.5% ($n = 11$), and most of which occurred after flap tooth extractions. A statistically significant association was observed between loco-regional complications and anti-hypertensive drug therapy (p=0.006). **Conclusions:** Ambulatory oral surgery procedures appear to be safe in medically compromised elderly patients, provided that a specific protocol is always followed, for their management.

Introduction

Ageing, medical compromission, particularly multimorbidity, defined as the presence of two or more unrelated long-term health conditions in the same individual, and drug therapies are the main factors involved in patient frailty which is a state of physiological vulnerability due to an alteration of the homeostatic reserve capacity and a reduced ability of the organism to cope with stress such as acute diseases, traumas and psycho-emotional events [1].

A positive association between the degree of fragility and the development of post-operative complications, such as infections, cardiovascular problems, and even death, has been found after surgery under general anesthesia in several surgical specialties [2–6], however, to the best of the authors' knowledge, this relationship has never been investigated in outpatient oral surgery.

The present study aimed to determine the incidence of medical emergencies and post-surgical complications in medically compromised elderly patients surgically treated for oral and dental pathologies in an ambulatory setting [7].

The study also aimed to assess if these events were statistically associated with any of the following variables: patient-related factors (such as gender and age); clinical factors such as compromised organ systems, drug therapies, and physical status class according to the American Society of Anesthesiologist (ASA); surgery-related factors, such as flap/flapless surgery, anesthesia with or without vasoconstrictor, and suture placement.

Materials and methods

The medical records of medically compromised patients aged 65 years or older, surgically treated on an ambulatory basis with tooth extractions and other dental surgeries between 1 September 2017 and 1 March 2024, at the Oral Surgery Complex Unit of the Department of Odontostomatological and Maxillofacial Sciences of the Sapienza University of

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Table I. NYHA classification of cardiac functional capacity and objective assessment*.

Class I. Patients with cardiac disease but without resulting limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitations, dyspnoea, or anginal pain. There is no objective evidence of cardiovascular disease.
Class II. Patients with cardiac disease resulting in slight limitation of physical activity. They are comfortable at rest. Ordinary physical activity results in fatigue, palpitations, dyspnoea, or anginal pain. There is objective evidence of minimal cardiovascular disease.
Class III. Patients with cardiac disease resulting in marked limitation of physical activity. They are comfortable at rest. Less than ordinary activity causes fatigue, palpitations, dyspnoea, or anginal pain. There is objective evidence of moderately severe cardiovascular disease.
Class IV. Patients with cardiac disease resulting in the inability to carry out any physical activity without discomfort. Symptoms of heart failure or the anginal syndrome may be present even at rest. If any physical activity is undertaken, discomfort active increases. There is objective evidence of severe cardiovascular disease.

* *Adapted from the New York Heart Association* [9].

Rome, were retrospectively analysed. For a procedure to be classified as ambulatory, patient was discharged within 30 minutes from the end of the surgical session. The study was approved by the local Ethical Committee with the protocol no. 6958. The Helsinki Declaration guidelines have been followed in this investigation.

For a case to be introduced in the study, complete clinical documentation and patient consent for statistical analysis of clinical radiographic data were mandatory.

Collected data included patient-, surgery- and complication-related variables. Patient-related variables were age, gender, systemic pathologies, prescribed medications (type and number), and ASA status. Surgery-related variables were type of surgeries, type of anesthesia, local hemostatic used, type of suturing technique. Complication related variables were intra-operative surgical complications, medical emergencies, post-operative complications, post-operative drug therapy, medical treatment for each possible complication, control visits.

For a patient to be classified according to the ASA classification, the following criteria were used [8]:

Class I: healthy patients; class II – patients with mild systemic diseases; class III – patients with severe systemic diseases; class IV – patients with severe systemic disease that is a constant threat to life. Class IV patients were never treated on an outpatient setting, clinical judgement was used for class II/III patient classification during the years under examination. Class III patients included those with poorly controlled diabetes and/or hypertension, stable angina, heart attack more than six months earlier, chronic renal failure, major obesity, chronic obstructive pulmonary disease, antithrombotic therapies and other non-serious coagulopathies, immunosuppressive therapies or conditions, functional class III heart failure according to the New York Heart Association (NYHA, Tab. I) [9].

This classification provides for a patient evaluation under physical activity. While class IV patients were never treated on an out-patient setting, careful evaluation was consistently conducted to distinguish class III patients, based on their functional reserve, to decide if surgery could proceed in an ambulatory, day surgery or inpatient setting.

All patients were treated with the following stress reduction protocol (SRP):

- Patients were recommended to rest adequately the night before surgery.
- Conscious sedation with benzodiazepines was used, where necessary and feasible.
- Surgical time was reduced—ideally under 30 minutes, and not exceeding 40 minutes. Whenever possible, long surgeries were planned into two or more sessions.
- Surgeries were not performed during the hottest hours of the day, to avoid possible negative systemic response, affecting the cardiovascular, pulmonary or renal systems [10].
- Post-operative pain was carefully managed with appropriate medication.
- Performing surgeries in the early hours of the morning, when functional reserve is highest (avoiding the first three hours after awakening, because of the higher risk of heart attack) [11].
- Anaesthesia was administered with minimal discomfort.
- Reduction of the number of people in the surgical room for creating a suitable and less agitated environment.
- Adequate medical and social support for 20–30 minutes immediately after treatment.
- Adequate support after surgery for returning home.
- Performing surgeries preferably during the first four days of the week, especially in patients at risk of bleeding, to allow follow-up for any complications the day after surgery and not during the weekend.

Sample size calculation

Since systemic complications are infrequent, the only data available in the literature on loco-regional complications in elderly subjects was used as a reference [8]. Therefore, a

sample of 199 patients was determined to achieve an effect size of 0.24 with an actual power of 0.95 and an alpha error probability of 0.05.

Statistics

All data were recorded in an Excel format file and analysed using SPSS software (Statistical Package for Social Sciences, version 20.0, 3 IBM Corporation, Armonk, NY, USA).

The descriptive analysis of the sample considered the distribution of patients according to the following factors: age, gender, systemic pathologies, medications taken (type and number) of prescribed medications, ASA status, type of surgeries, type of anesthesia, local hemostatic used (if the case), type of suturing technique, intra-operative surgical complications, medical emergencies, post-operative complications, post-operative drug therapy, medical treatment for each possible complication. The percentages of intra-operative and post-operative complications out of the total surgeries performed in the patients under study was calculated relative to the total.

Continuous data were summarized using mean and standard deviation. Categorical data were described using counts and percentages, and comparisons were made using the Fisher's exact test. A univariate analysis was used to identify the relationship between the possible occurrence of intra- and post-operative complications and all the study variables. In each test, threshold for statistical significance was set at $p < 0.05$.

Results

The sample comprised 199 patients, 113 males (56.7%) and 86 females (43.3%), with an mean age of 75.2 ± 7.66 years (Tab. II). To complete the therapeutic program, 15 patients underwent more than one session (average = 2.8 ± 0.43), so the total number of surgeries was 226.

No medical emergencies and intraoperative complications occurred. The incidence of loco-regional post-operative complications was about 5.5% (n=11) and most of them occurred after flap tooth extractions (Tab. III).

The "Complications" variable was compared with each of the following study variables: gender, age surgical *vs* non-surgical session, anesthesia with *vs* without vasoconstrictor, suture material, antihypertensive therapy, antiresorptive therapy, antithrombotic therapy, antidiabetic therapy, immunosuppressive therapy, cardiovascular therapy, other medications, metabolic conditions, cardiovascular conditions, hemostasis disorders.

Contingency tables were created on the SPSS software and the Fisher's exact test was used to analyse whether a statistically significant relationship was present between the onset of loco-regional complications and each of the other examined variables (Tab. IV). Given the limited number of non-extraction procedures, for statistical analysis, all procedures in which a flap was performed for bone exposure (extractions = 37, implant = 1, cystectomy =1) were considered as a single group (flap surgeries).

Table II. Overall characteristics of the study sample.

VARIABLES	N (%)
Patients	199 (100.00)
Gender	
M	113 (56.78)
F	86 (43.22)
Mean age (years)	75.2 ± 7.66
ASA class	
II	61 (30.65)
III	138 (69.35)
Suture material	
3.0 silk	91 (45.73)
3.0 poliglactin 910	93 (46.73)
PTFE	1 (0.50)
none	14 (7.04)
Multi-drug therapy	182 (91.46)
Local haemostatic application	122 (61.31)
Anaesthesia	
With vasoconstrictor	148 (74.37)
Without vasoconstrictor	51 (25.63)
Complications	
Intra-operative	0 (0.00)
Post-operative	11 (5.53)
Patients with complications	11 (5.53)

No statistically significant correlation was found between almost all the study variables and the complications. The only significant association found was between loco-regional complications and anti-hypertensive drug therapy (p=0.006; Tab. IV). These were three patients undergoing poly-pharmacological therapy (Calcium antagonist + antiplatelet + 5-alpha-reductase inhibitor + statin, ACE inhibitor + Antiplatelet + Proton pump inhibitor, Beta-blocker + Antiplatelet + Proton pump inhibitor), although one patient with complications did not take any medications.

No complications occurred in subsequent surgeries to which the 15 patients with multiple sessions underwent. These patients did not show complications also during their first surgical session.

Discussion

The incidence of medical emergencies and post-surgical complications in a sample of medically compromised older people patients surgically treated for oral and dental pathologies in an ambulatory setting was investigated, together with any possible association with patient-, clinical-, and surgery-related

Table III. Post-operative complications by surgical treatments.

Post-operative complications	Surgical treatments							Therapies for complications
	Biopsy (n=3)	Implants (n=1)	Cystectomy (n=1)	Extractions (n=194)				
				Single (n=76)	Multiple (n=118)	Flap (n=37)	No flap (n=157)	
Dehiscence	0	0	0	2	1	2	1	None
Exuberant clot	0	0	0	0	1	0	1	Clot and suture removal + new suture applying
Bone exposure	0	0	0	0	1	1	0	Analgesic medication
Hypoestesia	0	0	0	2	0	2	0	Bromelain+ vitamin B complex+ L-acetyl carnitine
Non-major bleeding	0	0	0	0	1	1	0	Telephone instructions for home management
Abscess	0	0	1	0	0	0	0	Antibiotic therapy
Alveolar osteitis	0	0	0	1	0	0	1	Local antiseptic therapy
Failure of osseointegration	0	1	0	0	0	0	0	Implant removal
Total	0	1	1	5	4	6	3	
None	3	0	0	71	114	31	154	
Total						**11 (5.53%)**		

factors. Although medically compromised individuals are generally considered at higher risk of systemic complications compared to healthy people [12], no medical complications were found in the present sample and no such data are available in the literature about the incidence of these complications in this kind of patients. Pre-operative risk assessment, including evaluation of physiological reserve is crucial in the management of medical risk patients, to reduce the probability of complications, especially for ambulatory surgery. Since physical activity is comparable to the psycho-emotional stress induced by ambulatory oral surgery, and a SRP has been found to really reduce medical complications [13], specific rules are implemented in the Oral Surgery Unit where all surgeries were performed, to avoid patient stress and worries during and after surgery, as much as possible.

As for the type of surgical setting, in the Oral Surgery Unit in which all surgeries were performed, patients have been treated in an ambulatory setting, with discharging within
30 minutes after surgery. A day surgery setting was employed when more than 30 minutes post-operative monitoring is expected, due to the type and time of the surgical procedure or to the pre-operative patient medical conditions. This includes cases where short general anaesthesia or intravenous access was necessary, the latter either to administer intravenous therapies or emergency or prophylactic medications, or to obtain blood for intra-operative monitoring of some chemical parameters. During the study period, only 31 medically compromised elderly patients were treated in the same surgical unit, in a Day Surgery setting and none in hospital setting (data not presented in tables).

Although the World Health Organization considered 65 years as the age of transition to the threshold for categorising an individual as elderly [14], seniority is a threshold that should be adapted to reflect current expectations and living conditions in countries with advanced development and that should therefore be adapted to the actual conditions of each population also in choosing treatment options [15]. Despite this, no systemic complications occurred, and no association was observed with patient age, since 6 patients with local complications were under 75 years old and 5 over 75.

The reason for ambulatory instead of inpatient care in dental patients is more often strictly related to patient preferences to be treated near where they live, by their general dental practitioners (GDPs) [16]. This allows patients to reach quickly and easily the ambulatory for treatment and in the same way return home without having a long journey, sometimes also without needing support from caregivers, friends or family members.

This is also true for medically compromised elderly patients since most of them can be safely treated in an ambulatory setting, not necessarily hospital. Despite this, many patients of the present sample have been referred to the Oral Surgery Unit by their GDPs without the latter did any patient medical assessment, probably because they did not

Table IV. Overall data from univariate statistics (significant values are highlighted in bold).

Variables		Complications		*p*-value
		Yes	No	
Patient gender	M	7	106	0.442
	F	4	82	
Session type	Flap surgery	6	33	0.171
	No flap surgery	5	155	
Extraction	Single (n=76)	5	71	0.229
	Multiple (n=118)	4	114	
Suture	Yes	11	169	0.322
	No	0	19	
Suture material				
Silk	Yes	5	86	0.612
	No	6	102	
Vicryl	Yes	6	87	0.322
	No	5	101	
PTFe	Yes	1	0	0.130
	No	10	188	
Haemostatic agent	Yes (n=111)	6	105	0.585
	No (n=88)	5	83	
Anaesthesia with vasoconstrictor	Yes	6	142	0.250
	No	5	46	
Cardiovascular disorders	Yes	10	166	0.630
	No	1	22	
Haemostasis disorders	Yes	8	130	0.550
	No	58	3	
Metabolic disorders	Yes	3	71	0.362
	No	117	8	
Medications				
Antihypertensives	Yes	3	131	**0.006**
	No	8	57	
Antidiabetics	Yes	1	32	0.428
	No	10	156	
Antithrombotics	Yes	8	122	0.431
	No	3	66	
Cardiological	Yes	5	84	0.599
	No	6	104	
Other medications	Yes	9	129	0.289
	No	2	59	

feel confident managing or lacked the time to manage the medical risk or because such a risk needs more time to be managed. In fact, ASA physical status has been found not frequently used among GDPs [17], while it is worldwide considered a useful tool to assess medical status of patient. Proper risk classification is essential to avoid performing surgery in inappropriate settings and/or for pathologies that can be postponed until the patient's medical conditions will allow him/her to undergo surgery.

Finally, although many different surgeons (university and hospital residents, under-, and post-graduate students) conducted surgeries, no medical problems and only a few local complications were observed, supporting the effectiveness of the adopted protocol in the management of this kind of patients.

No medical emergencies or post-operative systemic complications occurred, differently from the study of Trybek *et al.* [18] which, at the best of authors' knowledge, is the only published

study in which the same kind of patients was treated. In that study, 4.11% of such complications (3/73 cases of syncope) were reported, although, despite the elderly average age of the sample (67.8 ± 10.3) and 54% of medically compromised patients, the authors reported no data about medications.

It is also not possible to compare the present data about bleeding in patients on antithrombotic treatment with those of that study, since no cases of bleeding which required treatment have been reported in the present sample, apart from one case of exuberant blood clot.

The incidence of loco-regional complications is significantly lower than that reported in the study by Trybek *et al.* (20.55%) [18], but the present sample involved mostly simple extractions while in the study of Trybek *et al.* [18] all extracted teeth were impacted, so also the type of complications was different. In the present sample only 18.6% (n = 37) of the procedures involved impacted teeth, of which 13.51% (n = 5) with complications. Anyway, no statistical correlation was found between flap surgeries and the incidence of complications. Nor was a correlation found between multiple extractions and complications (Tab. IV).

Suture materials and complications

No statistically significant differences were observed regarding the type of suture material used for suturing and this agrees with the recent systematic review about suture materials in oral surgery by Faris *et al.* who found that only monofilaments ensure low levels of both tissue reaction and microbial accumulation, without significant differences between silk and polyglactin 910 [19].

Age and complications

In the present sample 7 out of 11 patients (63.6%) who experienced complications were under 75 years old, so older age is not related to the occurrence of complications.

Drug therapies and complications

The only statistically significant association was between loco-regional complications and the antihypertensive drugs. A potential negative effect on oral wound healing has been already suggested for antihypertensive drugs [20]. Worldwide, the most used classes of antihypertensive drugs are beta-blockers, calcium channel blockers, diuretics, sartans, and angiotensin-converting enzyme (ACE) inhibitors [21,22].

From both *in vitro* and animal studies, data emerged that indicated how antihypertensive drugs could alter wound healing in diverse ways. Calcium channel blockers appeared to stimulate cell proliferation and therefore facilitate epithelial tissue healing and especially connective tissue healing [23,24], while beta-blockers appeared to delay wound margin closure and re-epithelialization [25].

Despite the possible interference on healing, only few cases of complications appear to be directly attributable to antihypertensive drugs, so, it is possible that what observed could be the result of variables other than those considered. In fact, one patient who had local complications was taking calcium channel blockers, and 1 patient was taking beta blockers. Both these patients experencied healing problems; one developed an infection and the other a wound dehischence. However, many *in vitro* studies have shown that, in addition to their effects on cardiac muscle cells, calcium antagonists are able to suppress immune cells such as T cells, mast cells, and macrophages, such as T cells [26], mast cells [27], and macrophages [28], thus suggesting immunosuppressive activity.

In 70% of cases with complications patients were on antithrombotic treatments, although this association was not statistically significant. Wound healing in patients taking these drugs has been analysed in numerous studies [20,29], although only 2 complications of those recorded in these patients concerned clinical wound healing (dehiscence). In all these patients (n=129) the same management protocol had been applied, without treatment modification, using haemostatic agents and suturing at the surgical site [20]. No cases of non-major bleeding, defined as cases requiring re-admission but not transfusion [30], and only one case of an exuberant clot due to prolonged bleeding, were reported, although 64.8% (n=129) of the sample was on antithrombotic treatments and no treatment changes were performed before surgeries. This is in accordance with previously published data on dental extractions in patients receiving continuous antithrombotic therapy where non-major bleeding was a rare event (6/254 = 2.36%) [20].

Diabetes mellitus alone has been associated with an increased risk of cardiovascular emergencies due to increased coronary sclerosis compared to non-diabetic status [31]. Moreover, the risk of cardiovascular emergencies (angina, hypertensive crisis, myocardial infarction) is higher when patients also accompanied by arterial hypertension, with a risk increases substantially—by approximately four-fold—when diabetes is accompanied by hypertension [32]. In the present sample, only 9 patients suffered from both conditions, but no complications occurred.

Although metabolic disorders, and in particular diabetes mellitus, have been reported as risk factors for post-surgical infections in oral surgery [33], in the present study they were not found statistically related to the incidence of complications (Tab. IV). This result agrees with data reported by a recent systematic review of the Cochrane Library [34].

Additionally, no complications were observed in patients receiving antiresorptive medications (bisphosphonates, denosumab), antiangiogenics or any other drugs at risk for medication related osteonecrosis of the jaws (MRONJ), in accordance with what has already been reported in a previous retrospective study on this kind of patients performed in the same operative unit [35].

Study limitations

Several limitations may affect the interpretation of the present study results.

First, the number of local complications of the present sample may have been insufficient to establish statistically significant associations of the association with the analysed variables thus, a wider sample size could allow a better investigation.

Second, no control group was considered as the described protocol reflects the standard of care for management of medically compromised patients in the Oral Surgery Unit.

Third, most of the surgeries were tooth extractions, which can be scheduled in multiple sessions, each one under thirty or at most forty minutes. Only a few cases concerned other oral surgeries, which tend to be longer and more complex, and are less suited to ambulatory scheduling. Therefore, future studies could benefit from a sample in which more cases of other surgeries are performed, although longer times are often incompatible with ambulatory surgery in medically compromised elderly patients.

Fourth, the study sample is selected regarding the risk of medical emergencies and an adequate preventive protocol has always been applied. However, a recent Italian study performed with a questionnaire administered to 6818 dentists reported that 75.5% of the interviewees had at least one medical emergency in their professional life [36].

Therefore, it is of paramount importance, for clinical private practice, not only adopting appropriate preventive protocols but also performing robust pre-operative screening, to identify medical risk patients.

Moreover, the present study shares the typical limitations of a retrospective design such as the possible omissions or inaccuracies in clinical records on ambulatory clinical charts, such as medications, medical pathologies, and especially minor local complications. A prospective study is therefore desirable to verify if complications are really so infrequent in medically compromised elderly outpatients, and with which variables these complications are possibly related.

Conclusions

Oral surgery procedures seem to be safe in elderly medically compromised ambulatory patients provided that a specific protocol is always followed for their management, from admission to discharge. Since no systemic complications and only a few minor local complications occurred, it can be suggested that oral surgical care for such patients may be extended to general dental practitioners, in an ambulatory setting, out of hospital, also applied to most ASA III patients and to a broad range of oral surgery procedures, if emergency equipment is present and adequate training is periodically performed by medical and all other dental care personnel.

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Conflicts of interest

Authors do not have any financial or personal relationships with other people or organizations that can inappropriately influence their work.

Data availability statement

The data that support the findings of this study are not openly available due to reasons of sensitivity and are available from the corresponding author upon reasonable request and after approval of the local Ethical Committee that approved the study.

Author contribution statement

Roberto Pippi: conceptualization, methodology, table arrangement, writing-review & editing.
Beatrice Carta: data colleection, writing-review.
Piermario Palattella: data collection, writing-review.
Umberto Giuliani: statistical analysis, writing- original draft, (methods and results).

Ethics approval

The study was approved by the local Ethical Committee with the protocol no. 6958.

Informed consent

Patient's consent to the statistical treatment of clinical radiographical data was obtained.

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