

# Perioperative Management of Geriatric Patients for Maxillofacial Surgeries

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## ABSTRACT

With increasing life expectancy, the mean age of patient the maxillofacial surgeons and anesthesiologists have to treat is increasing. In this review article, we discuss the management of maxillofacial surgeries of geriatric patients under sedation and general anesthesia, and elaborate on the various issues faced perioperatively by the treating team. The challenges and differences faced in perioperative period in geriatric anesthesia were discussed and literature reviewed for the benefit of the operating surgeons.

**Keywords:** Geriatric, Oral Maxillofacial surgeries, Fracture, Tumours, Anesthesia.

## INTRODUCTION

With more than six percent of India's population above the age of 65 and a steadily increasing life expectancy of 69 years, the health care set up needs to be abreast with the unique needs of the geriatric population.<sup>[1]</sup>

Geriatric patients aren't just old adults. They come with a myriad of problems specific to their age group. Geriatric anaesthesia for maxillofacial surgeries combines the risk associated with old age, like decreased functional capacity, multiple comorbidities, cognitive dysfunction, multiple medications and the complications of surgery per se like difficult airway and blood loss, whereas from the surgeon's point of view they are prone to fractures and tumours. Their ability to deal with the surgical and post-surgical stress is also impaired making it prudent for the maxillofacial surgeons and anaesthesiologists treating such patients have the clinical acumen and foresightedness to evaluate carefully the pathophysiologic risk of comorbid disease in order to provide safe, expedient, and effective surgical care.<sup>[2]</sup> Elderly patients often need to be given general anesthetic or sedation even for procedures that can be done under local anesthesia for a younger patient with the same complaint due to their aforementioned co-morbidities, lesser compliance a. The most common maxillofacial ailments in the elderly group for which they seek treatment are for procedures like tooth extractions, preprosthetic surgeries, dental implant placement, oral cancer, maxillofacial trauma, infections, sialadenitis caused due to hyposalivation etc.

### What makes the elderly patient more susceptible to an overall increased surgical risk?

The physiologic changes that take place as a human body ages provides the impetus for any pathologic process to begin or manifest. Another important factor that plays a role are the psycho-social changes of the elderly.

There are well studied factors that steadily decline with age like glomerular filtration rate, glucose tolerance and hepatic blood flow whereas some factors remain stable like hematocrit and resting heart rate.<sup>[3]</sup> The stunted ability of the aged to cope with any stress is called homeostenosis and is a factor when considering post-op morbidity and mortality.<sup>[4]</sup> The response of autonomic nervous system to stress is also impaired with an increased vagal tone and decreased sympathetic activity. This limits an appropriate response of the cardiovascular system and leads to cardiac decompensation. The responsiveness to the existing endogenous catecholamines is also impaired further exacerbating the decompensation. The elderly also have cardiac hypertrophy and increased peripheral vascular resistance.<sup>[5]</sup> There is decrease in most pulmonary parameters leading to decreased vital capacity and arterial partial pressure of oxygen. This predisposes them to more postoperative pulmonary complications.<sup>[6]</sup>

Renal physiology changes like reduced glomerular filtration rate and decreased urine concentrating capacity is also observed.

As earlier mentioned, these physiologic changes provide the medium on which pathologic diseases thrive in an elderly patient. Vis a vis, in India, for the population over 70 years of age, more than 50% suffer from one or more chronic conditions. The chronic illnesses usually include hypertension, coronary heart disease, and cancer. According to Government of India statistics, cardiovascular

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disorders account for one-third of elderly mortality. Respiratory disorders account for 10% mortality while infections including tuberculosis account for another 10%. Neoplasm accounts for 6% and accidents, poisoning, and violence constitute less

than 4% of elderly mortality with more or less similar rates for nutritional, metabolic, gastrointestinal, and genito-urinary infections All these changes are summarised in [Table 1].<sup>[7,8]</sup>

**Table 1: Physiological changes in geriatric age group.**<sup>[8]</sup>

System	S structural changes	Functional changes
CNS	↓ in volume of both gray and white matter Shrinkage of subcortical white matter and hippocampus (more with hypertension & vascular disease)	Memory decline ↓ in neurotransmitters like dopamine, acetylcholine, norepinephrine and serotonin ↓ in brain reserve leading to- ↓ in functional activity of daily life ↑ sensitivity to anaesthetic medications ↑ risk of delirium ↑ risk of postoperative cognitive dysfunction
Neuraxial changes	↓ in epidural space area ↑ permeability of dura ↓ volume of CSF ↓ diameter and number of myelinated fibers in dorsal and ventral nerve roots	↓ conduction velocity All the structural and functional changes leads to ↑ sensitivity to neuraxial and peripheral nerve blocks
Cardiovascular System	↓ myocyte number ↓ in conduction fiber density and number of sinus node cells ↓ contractility ↑ myocardial stiffness and ventricular filling pressure ↑ central aortic dilatation ↑ thickness of arterial wall Aortic valve sclerosis and annular calcification	↓ β adrenergic sensitivity ↑ in sympathetic nervous system activity ↑ systemic vascular resistance and mechanical stiffening of peripheral vessels ↓ maximal heart rate and ↓ peak ejection fraction during exercise and stress which makes heart more susceptible to cardiac failure Diastolic dysfunction → diastolic heart failure
Re Respiratory System	↓ elastic recoil Altered surfactant ↑ in lung compliance ↑ in anatomic dead space ↓ diffusing capacity  ↑ closing capacity Impaired gas exchange Residual volume ↑ by 5-10% per decade Vital capacity ↓ Functional Residual capacity – unchanged/ slightly ↑	Ventricular response to hypoxia, hypercapnia and mechanical stress impairment secondary to ↓ CNS activity Respiratory depressant effect of benzodiazepines, opioids and volatile anaesthetics ↑ sensitivity for bronchoconstriction and ↓ response to treatment with inhaled β agonist ↓ immune response → ↑ susceptibility to environment exposure and lung injury
RENAL	Nephrosclerosis ↓ renal blood flow- 10% decrease per decade	↓ renal capacity to conserve sodium is decreased
HEPATIC	Liver volume decreased by 20-40% with aging Hepatic blood flow decreases 10% per decade	↓ in hepatic metabolism

**Table 2: Clinical Pharmacology of Anesthetic agents in elderly<sup>8</sup>**

Drug	Brain sensitivity	Pharmacokinetics	Dose
Inhalational agents	increased	↔	Decreased
Thiopentone	↔	Decreased initial volume of distribution	Decreased
Etomidate	↔	Decreased initial volume of distribution	Decreased
Propofol	increased	Decreased clearance	Decreased
Midazolam	increased	Decreased clearance	Decreased
Morphine	increased	Decreased clearance	Decreased
Fentanyl	increased	↔	Decreased
Vecuronium	Na	Decreased clearance	Decreased
Atracurium	Na	↔	↔
Cisatracurium	Na	↔	↔

## DISCUSSION

Management of geriatric patients involves preoperative assessment for risk- stratification, intra

operative management of comorbidities & complications and postoperative discharge planning. Even in the absence of a specific organ-based disease process, anaesthesia for the elderly requires

an alteration in technique to take account of age-related changes to normal physiology as discussed in [Table 1].<sup>[8]</sup>

#### **Pre-operative Assessment and Management-**

Some of the most common conditions for which an elderly needs surgical management of a maxillofacial disorder are: Multiple dental extractions not amenable to treatment under Local Anaesthesia due to comorbidities, preprosthetic surgeries, dental implant placement, oral cancer, maxillofacial trauma, infections, sialadenitis caused due to hyposalivation etc.

The preoperative management and assessment of a geriatric patient requires several factors to be kept in mind.<sup>[9]</sup>

Regular perioperative risk assessment measures may often overlook subtle geriatric-specific syndromes that translate into increased vulnerabilities for older patients. Although old age is not a disease, the age of the patient is the most important factor as there are physiological changes as given in [Table 1]. Several comorbidities are present in elderly - most commonly hypertension, diabetes, Coronary Artery Disease (CAD), cancer, and cerebrovascular disease (CVD). They should all be tackled individually, polypharmacy and drug interactions to be kept in mind. The extent and duration of surgery, planned technique of anaesthesia, blood products needed, expected post-operative care should all be discussed and adequate arrangements made. The patient's goals and treatment preferences, health care proxy or surrogate decision-maker should all be confirmed and documented.

Before starting the assessment, a comfortable and amicable environment should be created for the patient with provisions of an elevator, wheel-chair friendly OPD's and a separate queue for the elderly.

A preliminary nutritional assessment of the elderly patient to rule out low serum albumin levels should be done as it impairs post-operative wound healing, wound infection and increases risk of mortality.<sup>[10]</sup> A cognitive assessment of the patient is also important to understand by asking patient concrete and basic questions, sometimes taking the help of pictorial representations. If a patient is found to be giving inconsistent answers, the family member or caregiver must be included in the counselling. If patients cannot provide informed consent, alternative choices include written documents for power of attorney by chosen executors or power of living wills.<sup>[11]</sup>

In patients with existing advanced diseases, new risks associated with the surgical procedure and an approach for potentially life-threatening problems consistent with the patient's values and preferences should be discussed. Shortened fluid fast (clear liquids up to two hours before anaesthesia) and solid fasting should be considered. Adherence to existing best practices regarding antibiotic and venous thromboembolism prophylaxis should be done.

Nonessential medications should be stopped and only essential medications given. Incentive spirometry, deep breathing exercises should be started. Multidisciplinary approach with consultations from physical rehabilitation specialist, occupational therapy and post discharge home needs should be done.

#### **Counselling and consent in geriatric-**

Cognitive dysfunctions, memory loss, hearing loss, dementia, depression and stroke may all complicate the issues of consent and decision making. Talking about legal standards of competence for consent include- the abilities to communicate a choice, understand relevant information, appreciate the current situation and its consequences, manipulate the information rationally. The above mentioned features are often not present in elderly patients, making counselling and consent a difficult task in them.

#### **Medications:**

Usually these patients are on multiple medications and apart from prescription medications, they use various over the counter drugs mainly for pain management. These should be documented and clearly mentioned which medications are to continue and which are to be stopped before the procedure.

#### **Intraoperative management:**

##### **General considerations:**

Preoperative antibiotics should be given based on procedure, risk factors, and the hospital's unique pathogen profile within 60 minutes before surgical incision. Prophylaxis for endocarditis must be considered where necessary. Consideration of regional techniques to avoid postoperative complications and improve pain control should be taken. There should be a detailed perioperative analgesic plan including taking a directed pain history and plan multi-modal or opioid-sparing techniques with consideration of regional techniques.

In the maxillofacial setting, usually the first-line choices for mild to moderate pain are aspirin and acetaminophen. The preferred choice for pain relief is acetaminophen (200 to 400 mg every 4 to 6 hours with a maximum of 1.2 grams per day). Severe pain calls for administration of appropriate narcotics. Side effects of confusion, respiratory depression, and constipation should be weighed against the benefits of the drug.<sup>[12]</sup> Tramadol is given for moderate to severe pain.

Postoperative nausea risk stratification and prevention strategies should be taken. Prevention of postoperative pulmonary complications and hypothermia should be done. Appropriate use of intravenous fluids, restrictive or goal-directed strategies should be preferred over fixed-volume strategies, which can cause fluid overload in an

already compromised physiological state in elderly.<sup>[13]</sup> Appropriate hemodynamic management anticipating the fluctuations. Measures should be taken to ensure proper positioning and padding of bony prominences of elderly patients undergoing elective or nonelective surgery to maintain skin integrity and limit pressure on peripheral nerves and prevention of pressure ulcers. The elderly in particular are predisposed to hypothermia due to altered thermoregulation from decreased muscle mass, metabolic rate, and vascular reactivity. Patient warming with forced air warmers and/or warmed IV fluids should be used in older patients who are undergoing procedures longer than 30 minutes to avoid hypothermia.<sup>[14]</sup> The decision of administering sedation or general anaesthesia to the patient is dictated by many factors, more importantly by estimated duration of procedure, comorbidities and patient risk factors etc. Usually a patient with a procedure that can be done within an hour and with multiple comorbidities is given mild sedation. Procedures most likely to be considered to be done under sedation are dental extractions, preprosthetic surgeries, jaw osteomyelitis, salivary gland sialoendoscopies, temporomandibular joint arthrocentesis, dental implant placement etc. All major procedures like oral cancer and maxillofacial trauma are done under general anaesthetic.

The dentition of the patient must be examined before induction by a dental specialist. Elderly patients suffer from periodontal diseases and may have multiple loose teeth which may get dislodged during laryngoscopic manipulation. Any partial/complete dentures in the mouth must be likewise removed pre-operatively.

#### **Anesthesia in Elderly- Sedation**

Those elderly patients are candidates for sedation who are non-compliant, unable to obey instructions or who's health condition would worsen due to surgical stress.<sup>[15]</sup> Intravenous sedation under controlled setting is considered to be the safest method of sedation as it can be titrated and reversed efficiently. Dose adjustment is needed in the elderly with more time being given for action. Lowest possible dosage where patient is able to maintain airway is selected. Post-operative delirium should be watched out for.<sup>[16]</sup> Benzodiazepines may be given often to control pre-operative anxiety relief even in medically and cognitively impaired individuals.<sup>[17]</sup> A local anaesthetic should be given concurrently. For these patients, generally, not more than 2 dental cartridges of 2% Lidocaine with 1:100,000 epinephrine should be used for anesthesia, because minimal cardiac side effects are seen with this dosage.<sup>[18]</sup>

#### **General Anesthesia**

General anesthesia involves airway manipulation as well as administration of a cocktail of drugs, all of which are affected in the elderly.

Elderly patients are prone to structural and functional changes surrounding the airway, including, but not limited to, an edentulous mouth, loose teeth, partial/complete removable/fixed dentures, oropharyngeal tumors, atrophy of the glottic muscles, and decreased neck range of movements as compared to a young adult making bag mask ventilation(BMV) and intubation more difficult. In addition, age-related comorbidities such as COPD, gastroesophageal reflux disease (GERD), and diabetes increase the risk of aspiration pneumonia.<sup>[19]</sup> Desaturation occurs faster in older patients hence preoxygenation should be done religiously. The time to peak relaxation following neuromuscular blockade is delayed with increasing age and the elderly are more prone to have a cardiac event from desaturation.

The pharmacokinetics and pharmacodynamics of drugs are also altered in geriatrics. The ED 50 equivalent for inhalational anaesthetics falls linearly with age therefore, the dosage of drugs affecting CNS need be reduced. Hypotension is very common so the dosages of agents like propofol, opioids, benzodiazepines, thiopentone etc should be titrated as shown in [Table 2].<sup>[8]</sup>

Short acting drugs should be selected. Peak effects of drugs administered is delayed: midazolam 5 mins, fentanyl 6-8 min, and for propofol 10 minutes. Autonomic neuropathy of diabetes, diminished gut motility and diminished hepatic functions makes geriatric patients vulnerable to side-effects of opioids and anaesthetic drugs. Aging of the ANS shows (1) limited adaptability to stress (2) decreased basal activity of the parasympathetic nervous system and overall net activation of the sympathetic nervous system (3) decreased baroreflex sensitivity (4) slowing and weakening of homeostatic functions. The increase in sympathetic tone in older patients should also be considered when choosing an anesthetic with sympathomimetic properties, as such anesthetics may be poorly tolerated by some individuals with cardiovascular disease.

#### **Post-operative management**

In elderly patients post-surgical stress, both physical and psychological leads to an imbalance in autonomic, endocrine, metabolic, and immune functions. Depending on the patient's preoperative physiologic reserve and comorbid conditions, additional clinical challenges may impose further alterations in the stress response and the recovery trajectory.<sup>[20]</sup> Common postoperative complications in elderly include delirium, pulmonary complications, falls, undernutrition, urinary tract infection (UTI), pressure ulcers, and functional

decline. After maxillofacial surgery patient is unable to return to his normal diet longer than for surgeries done elsewhere in the body. Nutritional and fluid support should be adequate during such a period.

#### **Postoperative cognitive dysfunction (POCD) and delirium**

Postoperative cognitive dysfunction (POCD) refers to a deterioration in cognition temporally associated with surgery as quantified by neuropsychological tests. Although all major surgeries in elderly are a risk factor for development of POCD or delirium, patients with pre-operative dementia have a high incidence of post-operative delirium of 32–53.3 % due to physiological and psychological stress from injury, pain, analgesia and surgery. Marcantonio et al developed a criteria of risk factors for development of POCD in some surgeries.<sup>[21]</sup>

The risk factors were: 1.Age>70 yr 2.Alcohol abuse 3.Poor cognitive status 4.Poor functional status 5. Markedly abnormal sodium, potassium, or glucose 6.Non-cardiac thoracic surgery 7.Aortic aneurysm surgery, with one point given to each risk factor. 0 points, <1%; 1 point, 8%; 2 points, 19%; and 3 points, 45%.

In order to prevent POCD and delirium post operatively, adequate pain control, optimum physical environment (for example, sleep hygiene, sleep protocol, minimize tethers, encourage family at bedside), accesible vision and hearing aids, early removal of catheters, minimal psychoactive medications, adequate fluid and nutrition status should be provided and potentially inappropriate medications should be avoided.<sup>[22]</sup>

#### **Respiratory complications**

Older adult patients are at risk for postoperative pulmonary complications, including atelectasis, hospital acquired pneumonia, and acute respiratory failure. These kinds of complications increase the risk of long-term mortality following surgery. Additionally, older age may be an independent predictor of postoperative pneumonia, after adjustment for comorbidity burden.<sup>[23]</sup>

To avoid postoperative respiratory complications several measures can be taken. Intermediate (like cisatracurium, rocuronium, vecuronium) and long acting neuromuscular blocking agents (like pancuronium) should be avoided. When neuromuscular blockade is used, adequate recovery of neuromuscular function prior to extubation should be ensured. Preoperative incentive spirometry and deep breathing exercises should be started as already mentioned. Early mobilization and ambulation should be done and aspiration precautions should be taken.

#### **Thromboembolism-**

Increasing age is a known risk factor for thromboembolism.<sup>24</sup>Other risk factors which may add up to the list are surgery, trauma, immobility, lower extremity paresis all of which may be found in

orthopedic patients. Prophylaxis to prevent venous thromboembolism (VTE) should be taken whenever possible. The elderly should be put on intermittent pneumatic compression devices on a priority basis during and after prolonged orthopedic surgeries.

#### **To perform surgery or not?**

Considering the age related physiological changes, comorbidities, nature of surgeries, unwillingness to undergo surgery in geriatric age group, the question arises whether surgery should be performed or is conservative management better.

Most major geriatric maxillofacial surgeries are done for edentulous fractures or tumours. As discussed by Gerbino et al, surgical intervention is less frequently indicated in the elderly population for midfacial or mandibular fractures due to physiologic, psychologic, and social changes brought on by the aging process. Only such cases where there's a considerable functional deficit is surgical treatment considered.<sup>[25]</sup> Similarly a large proportion of patients look for non-invasive treatment options for edentulism to avoid going into the operation theatre.

A multitude of factors influence the surgical outcomes in older patients, such as the type, duration, and invasiveness of an operation, coexisting medical or mental status dysfunction, and the skill and expertise of both the anesthesiologist and surgeon hence eventually it has to be a combined decision of the patient, attendants, the concerned physician, maxillofacial surgeon and the anaesthesiologists to weigh the risk vs benefit ratio of whether the patient should be managed conservatively, where possible, or to go ahead with surgery.<sup>[9]</sup>

## **CONCLUSION**

A multidisciplinary approach is required for perioperative management of geriatric maxillofacial cases. As our population continues to age, anesthesiologists and surgeons are tasked with identifying anesthetic techniques that minimize morbidity and mortality and postoperative cognitive disorders in the older patient. To conclude we would say that age is just a number and every patient needs to be individualised according to the comorbidities, type and duration of surgery, expected complications thus deciding about the anesthesia technique hoping for the best but preparing for the worst. As of the year 2020, if you are not a pediatric specialist, you are a geriatric specialist.

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