CHAPTER – 9

Frailty and General Anesthesia

Background:

Amnesia, unconsciousness, and immobility are all goals of general anesthesia (GA). GA, by definition, produces all three of these therapeutic effects in a reversible manner. Inhaled gases and intravenous agents are examples of general anesthetic medications. Anesthetists may use other medication types to achieve specific therapeutic aims during surgery. [1, 2]It's not just a matter of academic curiosity to distinguish between the clinical goals of general anesthesia.[3] Surgeons prefer an immobile patient for better exposure and precision, whereas patients prefer unconsciousness and amnesia during surgery, thus resulting in divergent goals.[4]

In major surgery, general anesthetics are frequently utilised. Patients are given a range of general anesthetics, either alone or in combination, to obtain the desired level of anesthesia for surgery. GA has long been thought to be completely reversible, with the central nervous system (CNS) returning to its original state once the anesthetic drug is removed from the active site. However, studies show that disrupting the regular functioning of these targets might have long-term beneficial or negative consequences.[5]

Action of GA in the CNS:

According various studies on the mechanism of Gas, it influences the neuronal activity through numerous receptor proteins,thereby exerting amnesic, analgesic,

sedative, and immobilising actions. GABA receptor (propofol, etomidate, isoflurane, sevoflurane), NMDA receptor (nitrous oxide, xenon, ketamine), glycine receptor, and two-pore potassium channel are the most well-known receptor targets.[6,7] Such inhibitory and activating receptors are widespread in the mammalian brain, and they may arbitrate GAs' undesirable, off-target effects, which can lead to long-term cognitive impairment. In this sense, the developing and elderly brains' exceptional plasticity/ connectivity and limited compensatory capacity, respectively, may make them sensitive to the widespread, undesirable effects of GA.[5]

In recent years, anesthesia-related problems and death rates have been dramatically reduced. However, anesthesia-related complications such postoperative nausea and vomiting (PONV) or delirium should not be overlooked.[8] Firstly, patients are concerned about anaesthetic side effects. Secondly, because these side effects can result in lengthy hospital stays and significant healthcare expenditures, they are both organizationally and economically burdensome.[9] These factors tend to further deteriorate the condition of a pre-frail or frail individual.

Frailty and GA:

Patients over the age of 60 make up 25% of the population and are at a higher risk of complications during surgery. As a result, medical research and practise are focused on lowering postoperative morbidity and mortality. Dependence on caretakers and cognitive impairment are two key risk factors in the elderly, particularly in frail patients following surgeries under GA.[10]

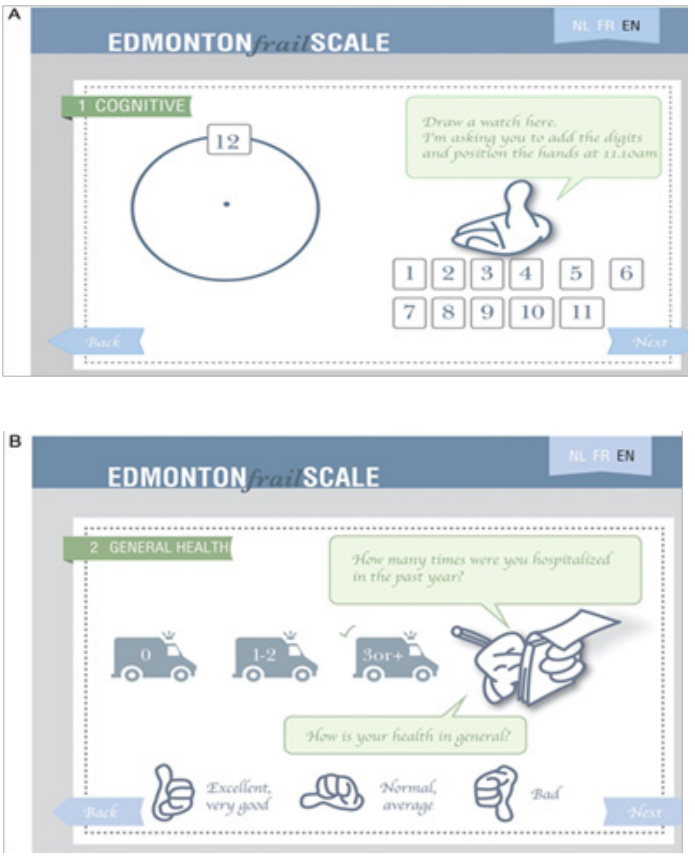
Frailty grows increasingly common as people get older, with up to 50% of those over the age of 85 being frail.[11] The frail older patient is a common occurrence for anaesthetists.

Despite the high frequency with which frailty is encountered, it is rarely formally tested, diagnosed, or discussed as part of a patient's risk profile. This is despite the fact that there is an independent link between frailty and higher postoperative morbidity, particularly the development of postoperative complications and the length of acute hospital stay, both of which should be of interest to doctors and healthcare executives. [12] Furthermore, recognising frailty and using it in conjunction with other risk factors, such as theAmerican Society of Anesthesiologists (ASA), enhances the predictability of postoperative complications. [13]

Preoperative assessment of frailty before administering GA:

In the medical literature, there is a large body of evidence that links frailty to outcome. The surgical and perioperative evidence is now being obtained, and a quick examination of the frailty assessment tools indicates the many ways used to acquire evidence of negative surgical outcomes. Over 60 assessment tools are currently in use for research and therapeutic purposes. Every method has its own set of advantages and disadvantages. The Fried Frailty Phenotype, for example, is time-efficient and straightforward, although it necessitates the use of specialised equipment. Nevertheless, the Edmonton Frail Scale (EFS) is a 17-point scale that can be given to each patient in a couple of minutes and has been validated for use by non-geriatricians to assess frailty. [14] The EFS is available as a free smartphone app in English, French, and Dutch, and takes about 5 minutes to complete in each patient (Figure 1).

Figure 1: The Edmonton Frail Scale (EFS) for preoperative assessment of frailty



(a) The Edmonton Frail Scale app screen shot. The first task is to draw a clock face, and then put on the hands at 10 past 11. The numbers from the app can be dragged onto the clock face. (b) Edmonton Frail Scale screen shot with question asking about how many times the patient was in hospital in the last year. The whole process takes about 3 min and gives a final score out of 17.

Image adopted from: Griffiths R, Mehta M. Frailty and anaesthesia: what we need to know. Continuing Education in Anaesthesia, Critical Care & Pain. 2014 Dec 1;14(6):273-7.[15]

The use of a single instrument in all clinical settings, by all disciplines, specialties, and grades, is ideal. The EFS 17-point scale takes about 5 minutes to complete. The EFS's 'get up and go' test has recently been found to predict morbidity and mortality in a variety of surgical specialties.[16] The test isn't useful in most emergency cases, but it's useful in anesthetic evaluation clinics, where this part of the scale can be evaluated when a patient gets up and enters the clinic or leaves at the conclusion.

A routine preoperative neurocognitive assessment is included in the current ACS-AGS Guidelines for Optimal Preoperative Assessment of the Geriatric Patient. "Mini-Cog" is a short, easy-to-use, and well-studied tool for patients who have no prior history of cognitive impairment.[17] For detecting and anticipating common postoperative problems such as postoperative delirium (POD) or cognitive dysfunction, meticulous documenting of the patient's preoperative cognitive condition is essential (POCD). [18, 19] POD is predicted by pre-existing cognitive impairment. Longer hospital stays, greater mortality, and functional deterioration are all linked to postoperative cognitive impairment. Patients with decreased cognition are less likely to participate in active pulmonary hygiene and ambulation following surgery, increasing the risk of postoperative complications such as pneumonia, deep vein thrombosis, stroke, and cerebrovascular accident with neurologic loss.

Anesthetic management of a frail patient:

Typical monitoring (electrocardiogram (EKG), pulse

oximetry, noninvasive blood pressure) or invasive monitoring (neuromuscular blockade, capnography, inspiratory oxygen fraction) with required BIS monitoring (Figure 2) must be set up for the patient for anaesthetic management. The usage and selection of a muscle relaxant, as well as intubation or the construction of a supraglottic device, should be at the anesthesiologist's discretion. The practitioner's judgement on fluid management and hemodynamic control is left to their discretion. Any perioperative events that affect the patient's prognosis, such as prolonged arterial hypotension, abrupt bleeding, or myocardial ischemia, may have an indirect impact.

During anaesthesia, all events must be meticulously recorded.[20]Postoperative nausea and vomiting prophylaxis should be given after recording the Apfel score (Figure 3a &3 b). [21] To avoid chronic drowsiness, it is particularly advised that the tube be removed as soon as the anaesthesia is stopped.

Figure 2: Bispectral Index scores

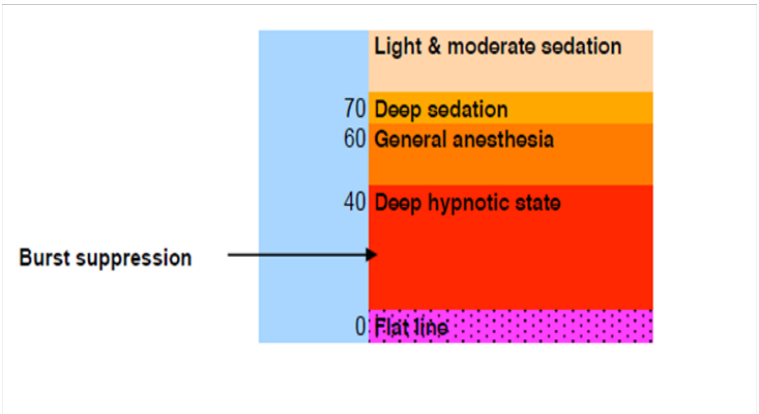


Figure 3: a) risk factor for PONV b)Apfel score for PONV prophylaxis

a

Risk Factor	OR	95% CI
Female gender	2.57	2.32–2.84
History of PONV/motion sickness	2.09	1.90–2.29
Nonsmoker	1.82	1.68–1.98
Age	0.88	0.84–0.92
Volatile anesthetics	1.82	1.56–2.13
Nitrous oxide	1.45	1.06–1.98
Postoperative opioids	1.39	1.20–1.60
Cholecystectomy	1.90	1.36–2.68
Laparoscopy	1.37	1.07–1.77
Gynecological	1.29	1.02–1.52

OR, odds ratio; CI, confidence interval; PONV, postoperative nausea and vomiting.

b

Risk Score	Prevalence PONV	Prophylaxis: No of Anti-emetics
0	9%	0-1
1	20%	1
2	39%	2
3	60%	3
4	78%	4

Importance of BIS in frail patients:

The BIS monitor was the first quantitative EEG index to be used as a monitor to determine the level of anaesthesia in clinical practise. Only the hypnotic component of anaesthesia is measured using BIS technology. The raw EEG data was reviewed during this process, and parts with artefacts were eliminated. As patients transitioned from an awake to a totally sedated state, several EEG characteristics were detected. The best mix of these features was determined using multivariate statistical models. This data was then converted to a linear scale ranging from 0 to 100.

A BIS score is not the same as a physiologic measurement like blood pressure in millimetres of mercury. BIS values measure changes in the brain's electrophysiologic condition

during anaesthesia. A typical BIS score for conscious patients is 90 to 100. A BIS score of 0 indicates complete suppression of cortical activity, sometimes known as a flat line. BIS scores drop during sleep, although not to the extent that large anaesthetic dosages do. The lower the number, the stronger the hypnotic effect. A BIS rating of less than 60 indicates a low likelihood of responding to commands. [22]

The state of the brain right before the reading is indicated by a BIS score, which is calculated from the preceding 15 to 30 seconds of EEG data. Furthermore, in response to severe stimulation, brain state as assessed by BIS may change fast.[23]

Intraoperative neurologic monitoring devices:

Over the last few years, devices for determining the degree of anesthesia have been created. The BIS index monitor, the entropy module, and the narcotrend monitors are all based on electroencephalographic changes and use Fourier's theorem to convert the electroencephalographic signal into an interpretable numerical readout. Although further research is needed to verify some of the benefits attributed to these devices, there is already evidence of their benefits, particularly in patients with neurological or critical risks, such as the elderly.

These devices allow for tighter control of anesthesia's effects on the brain from an anesthetic standpoint, as they allow observation of signals that appear to be related to patient outcomes. Most importantly, in frail patients, these devices allow the better control of the depth of anesthesia and thus aids in reducing the chances of post-operative anesthetic complications.

Regional versus general anesthesia in frail patients:

There is no clear-cut evidence to suggest that one technique to superior to other. Many systematic reviews and meta-analyses have given inconclusive results and have suggested long-term randomized clinical trials to arrive at a conclusion. To date, the available data recommends that both regional and anesthesia have their own advantages and disadvantages and post-operative cognitive decline is slightly more prevalent in cases administered with GA. But this increased prevalence is statistically and clinically non-significant. [24, 25, 26]

It has to be remembered that there is a dose–effect relationship of medications in the central or peripheral nervous system as a result of the deterioration of myelin bridges and reduced amount of cerebrospinal fluid.

Also, refer chapter 8 for studies comparing the regional and general anesthesia in frail patients.

Summary:

Due to age-related physiological deterioration, various comorbidities, and polypharmacy, older patients have a higher risk of negative surgical outcomes.[15] In the perioperative context, principles of care for older patients should include anaesthetic techniques that result in rapid recovery, drug dose according to individual pharmacokinetic variance, and appropriate pain management tactics. The European Society of Anesthesiology's consensus guideline on postoperative delirium recently concluded that there is insufficient evidence to recommend a specific type of anaesthetic technique, but it does recommend intraoperative monitoring to avoid blood pressure swings and anaesthesia depths that are too deep. [27]

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