Review Article

Clinical conundrums and challenges during geriatric orthopedic emergency surgeries

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ABSTRACT

Despite so many advancements and innovations in anesthetic techniques, expectations and challenges have also grown in plenty. Cardiac, pediatric, obstetric and neuro-anesthesia have perfectly developed to fulfill the desired needs of respective patient population. However, geriatric anesthesia has been shown a lesser interest in teaching and clinical practices over the years as compared with other anesthetic sub-specialties. The large growing geriatric population globally is also associated with an increase number of elderly patients presenting for orthopedic emergency surgeries. Orthopedic emergency surgery in geriatric population is not only a daunting clinical challenge but also has numerous socio-behavioral and economic ramifications. Decision making in anesthesia is largely influenced by the presence of co-morbidities, neuro-cognitive functions and the current socio-behavioral status. Pre-anesthetic evaluation and optimization are extremely important for a better surgical outcome but is limited by time constraints during emergency surgery. The current review aims to highlight comprehensively the various clinical, social, behavioral and psychological aspects during pre-anesthetic evaluation associated with emergency orthopedic surgery in geriatric population.

Key Words: Cognitive dysfunction, deep venous thrombosis, geriatric, geriatric anesthesia, orthopedic emergencies

BACKGROUND

Ever since the beginning of human life, efforts have been made in medical field so as to provide newer therapeutic options for a better quality of life. This rigorous struggle has been largely successful in increasing the life expectancy throughout the globe that constitute a driving force for the geriatric population to flock the health sector for elective and emergency surgical procedures. Early mobilization and rehabilitation of geriatric patients with orthopedic trauma are essential, so as to minimize the fracture-associated pain and discomfort and to decrease the morbidity and mortality. However, orthopedic emergency surgery in geriatric population is a daunting clinical task which also has socio-behavioral and economic ramifications especially in developing nations. The current review aims to highlight comprehensively the various clinical, social, behavioral and psychological aspects during pre-anesthetic evaluation associated with emergency orthopedic surgery in geriatric population.

LITERATURE SEARCH STRATEGIES

Articles in various international and national bibliographic indices were extensively searched with emphasis on key words like geriatric orthopedic surgery, geriatric anesthesia, emergency orthopedic surgery, and emergencies in elderly and anesthetic management in emergency orthopedic surgeries. The various search sites included Entrez (including PubMed), NIH.gov, and Medscape.com, Science direct, Scopus, WebMD.com, MedHelp.org, Searchmedica, MD consult and google.com. The inclusion criteria were mainly focused on extraction of full text articles containing literary evidence of anesthetic management in emergency orthopedic surgery in elderly from the period of year 2000 and onwards. Manual search was also carried out and various text books of emergency medicine, anesthesiology, critical care and orthopedics were looked for geriatric anesthesia in emergency orthopedic surgery.
IMPACT OF ASSOCIATED CO-MORBIDITIES

Emergency orthopedic care involves critical clinical decisions due to associated co-morbidities in majority of elderly population. Cardiovascular diseases, respiratory disorders, endocrinopathies, diminishing hepatic functions, variably impaired renal functions, nutritional deficiencies, gastro-intestinal tract dysfunctions, cognitive and neuro-behavioral changes, common practice of polypharmacy and many other co-morbid diseases largely determine the course and impact of surgical interventions.[9]

The outcome is generally poor as compared with younger generation as the behavior of aged body under physiologic stress can be highly unpredictable, which can be a potential enhancer of morbidity and mortality. The literary evidence over the years has proven a higher morbidity and mortality at one month and one year in elderly patients with hip fractures, if the surgical intervention is delayed. Delayed surgery inflicts further insults as compromised elderly patients can develop orthostatic hypotension, worsening of cardiovascular status, higher incidence of thrombo-embolism, bedsores and other diseases due to immobility.[4]

INJURY CLASSIFICATION AND SURGICAL DECISION MAKING

Classifying injury is again a daunting task as it is difficult not only clinically but is also a greater psycho-social concern so as to label an injury as emergency requiring surgical intervention? The accumulated evidence from injury severity scale (ISS) taking disability resulting from such injury as a denominator, majority of orthopedic injuries in elderly can be termed surgical emergencies with a variable risk involved. The decision making should adopt a multidisciplinary approach by involving specialists from orthopedics, anesthesia and emergency medicine right from the initial stages. Assessment of psycho-social, neuro-behavioral and cognitive aspects during pre-anesthetic evaluation can provide a better platform to formulate anesthetic and surgical plans. Various scoring systems and classifications have generated huge controversies regarding the upper cutoff age to label a patient geriatric. Patients above 70 years are usually termed geriatric as per ISS, while advance trauma life support (ATLS) and eastern association for surgery in trauma (EAST) guidelines recommend an age of 55 and 65 years, respectively to label a patient as geriatric.[5-7] The current review consider 65 years as an upper cutoff age because it is a commonly accepted age criteria, worldwide.

CHANGING FACE OF GERIATRIC ANAESTHESIA

Contrary to traditional anesthesia practice, nowadays chronological age is no more considered as any limitation for administration of anesthesia. The revolution has largely been adopted from the concepts in teaching and clinical practice that geriatric patients should not be considered as “old adults” the way we do not consider pediatric patients as “young adults”. New approaches and various explorations pertaining to geriatric surgery have been made possible on a platform provided by anesthesia scientific scale. The intellectual rigor and practical usefulness of geriatric anesthesia has opened up newer horizons for training of post-graduate students. As a matter of fact, it is exceedingly appropriate to teach that adult physiological changes are insufficient foundations on which to base our anesthesia practice in geriatrics.[9]

However, improved basic understanding of senescence from molecular, cellular and physiological perspective has drastically improved the anesthesia practice over the years.[8] Historically, teaching of geriatric physiology was given lesser importance as compared to pediatric and obstetric anesthesias. At present, the advancements in geriatric anesthesia aim to provide a balancing act by not only achieving efficiency in anesthetic technique but also providing a better patient satisfaction.

PRE-OPERATIVE ASSESSMENT

The pre-anesthetic check-up is mainly focused upon medical, surgical and anesthetic history to quantify the degree of associated co-morbidities, planning of appropriate corrective measures, stratification of risk associated with surgery and formulation of individual based anesthetic plans.

Physiological changes in the elderly

The aging process lends an insufficient guidance to administer various anesthetic drugs as the dose-response curve is highly variable among different geriatric cohorts. The diminishing physiology can cause pharmacokinetic and pharmacodynamic alterations, which directly affects the anesthetic drug delivery mechanisms. Aging induced imbalance of various body proteins including albumin and alpha-1 acid glycoprotein can drastically influence the drug binding, free fraction, clearance, volume of distribution and apparent potency of various anesthetic drugs. The physical senescence is characterized by a generalized decrease in functional reserve capacity and a variable declining ability to cope up with physiologic stress.[9] Muscular strength decreases as a result of decreased lean body mass and diminishing muscle fibers, which make the aging group highly vulnerable to fall and injuries. Several other factors including gait disturbances, cognitive dysfunction, impaired co-ordination, diminishing reflexes, vision disturbances further add to the risk of falls and injuries.[10] Higher rate of bone loss and density due to osteoporosis makes post-menopausal women more prone to injuries.[11]
Mechanism of injury
Cognitive dysfunction may be present in 1/3rd of geriatric patients presenting to emergency medicine department but is grossly under recognized to the extent of 5–6%.[12] Falls constitute 75% of all geriatric traumas and frequency of blunt trauma is higher than penetrating trauma. Higher incidence of morbidity and mortality is observed in geriatric patients with fractures of long bones after falls associated with head injury, chest trauma, penetrating injuries and co-morbidities.[2] Injury mechanism assumes significance in elderly as there are higher chances of missing occult injuries.[1]

Allergy, medication and anesthetic history
It is useful to elicit allergy history, history of intolerance, current medications and polypharmacy specifically anti-coagulant drugs, which can have potential impact on surgical preparation and anesthetic planning. Any previous history available, which is related to difficult airway management, postoperative nausea and vomiting (PONV) or any other postoperative complications can be invaluable for designing and choosing present anesthetic technique.

Anti-coagulants pose serious concerns in this surgical population for causing a higher volume of bleeding during emergency surgery, as minimum time is available for preoperative optimization.[13] An appropriate evaluation of beneficial effects and possible risks of stopping these drugs pre-operatively is mandatory. The nature and severity of surgery, degree of compromise in quality of life, biochemical values of coagulation profile and availability of anti-coagulant reversal agents are highly decisive. Statins, taken for cardiac diseases and deranged lipid profile, and succinylcholine interaction can also possibly cause serious muscular damage post-operatively.[14] Patients taking long-term steroids for respiratory and auto-immune disorders have delayed wound healing and possible adrenal crisis, thus increasing morbidity and mortality. Metoclopramide prolongs the action of succinylcholine, mivacurium and remifentanil possibly by interfering with the action of plasma cholinesterase.[15] Cimetidine and metronidazole prolongs the half-life of β-blockers and local anesthetics by depressing their respective metabolic degradation in hepatocytes.[16] Neurological assessment in head injury is difficult if patients are currently on psychotropic and anti-Parkinsonian drugs or if any cognitive dysfunction is present. Use of topical solutions and systemic medications for glaucoma also increase the difficulty in clinical assessment of head injury patients by observing pupillary reactions. Similarly, herbal drugs and alternative medicines which are widely used in developing nations like India can also possibly interfere in regional and general anesthesia techniques.[17]

Use of regional anesthesia (RA) has been covered well in the American Society of Anesthesiologist (ASA) recommended guidelines. The RA scores better than general anesthesia (GA) in such patients as drug tolerance is high due to chronic analgesic use in elderly and provision of post-operative pain relief with epidural catheter. However, the availability of literary evidence is limited regarding preference of regional over GA so as to decrease morbidity and mortality.[18]

Clinical assessment and optimization
Individualized systemic examination related to different organ systems is important both for pre-op evaluation and optimization before surgeries due to low functional physiologic reserve and associated co-morbidities. However, during emergency surgery, time being a constraint, one has to prepare the patient for surgery in a minimal possible period.

Cardio-vascular evaluation
Clinically, cardiac status assessment is commonly done by estimating metabolic equivalents, which roughly conveys the patient’s functional capacity to tolerate surgical and anesthetic insults.[19] American College of Cardiology (ACC) and American Heart Association (AHA) have classified predicted cardiac morbidity and mortality on the basis of major, intermediate and minor categories of cardiac disease severity pre-operatively [Table 1]. These recommendations are extremely helpful in evaluating the possible beneficial and risk factors of underlying cardiac disease and possibly reducing the need for any un-necessary investigations. Exercise stress testing, dobutamine stress testing, thallium scintigraphy, transthoracic echocardiography and recently cardiopulmonary exercise testing are few important investigations, which should be done before surgery.[20] As per AHA, orthopedic surgery comes under the category of intermediate risk, which can have cardiac complication rate up to 5% [Table 1].

Pre-operative risk assessment should cautiously evaluate all the possible risk factors causing deep venous thrombosis (DVT) such as malignancy, dehydration, dyspnea, hypertension, any other postoperative complications, or any other postoperative complications can be invaluable for designing and choosing present anesthetic technique.

Table 1: AHA classification of cardiac risk in patients undergoing non-cardiac surgery

| Risk category | Risk incidence (%) | Type of surgery |
|---------------|--------------------|-----------------|
| High          | > 5                | Aortic          |
|               |                    | Major vascular  |
|               |                    | Cardiothoracic  |
|               |                    | Emergency       |
| Intermediate  | 1-5                | Long with large blood loss or fluid shifts |
|               |                    | Head, Neck      |
|               |                    | Infrarenal      |
|               |                    | Intrathoracic   |
|               |                    | Orthopedic      |
| Low           | < 1                | Ambulatory surgery |
|               |                    | Endoscopy       |
|               |                    | Superficial procedure |
|               |                    | Cataract Breast |

AHA: American heart association
prolonged immobilization, a prior history of DVT or pulmonary embolism (PE). Regional anesthesia, intermittent leg compression devices and compression stockings are few strategies, which can help in minimizing these risks.[23] Low molecular weight heparin, warfarin, fondaparinux and others are quite effective at this stage but there is also concern about possible bleeding complications, which may put surgical wound, implant or patient at risk. Anticoagulants can be responsible for excessive bleeding and current recommendations allow a 12-hour interval between low molecular weight heparin and epidural/spinal injection or epidural catheter removal.

**Pulmonary function assessment**

In elderly, decreased lung compliance, diminished functional residual reserve, reduced forced expiratory reserve, muscle weakness and diminished sensitivity of central nervous system (CNS) to hypoxia and hypercapnia can lead to potential peri-operative and post-operative respiratory complications. Besides chest X-ray and simple bedside maneuvers such as breath holding time, presence of any respiratory dysfunction mandates ordering of pulmonary function tests.[24] Incentive spirometry, smoking cessation, bronchodilator therapy, breathing exercises and chest physiotherapy can vastly improve respiratory status and thus reduce post-operative respiratory morbidity.

**Cement reactions**

Cement implantation syndrome can occur due to methylmethacrylate used for fixing the prosthesis. Use of cement to fix the protheses in place may lead to bone–cement implantation syndrome characterized by hypoxia, hypotension and cardiovascular collapse including cardiac arrest. The clinical symptoms can be observed after cement insertion but can be delayed also and most likely results from raised intramedullary pressure causing fat embolization.[25] The preventive and management strategies include administering higher percentage of oxygen, optimizing volume/vascular status, cessation of nitrous oxide, pharmacological treatment of hypotension, active suctioning at the wound site by the orthopedician and a proper consent from the patient after explaining to him the potential complications. Steroids can be used but their role has been doubted in few of the research studies.

**Neurological examination**

Neurological assessment is difficult as many of these patients have neurodegenerative disorders and a variable degree of cognitive dysfunction. Vital information regarding the patient’s socio-clinical status can be elicited from family members and friends. Mental state should be thoroughly assessed pre-operatively, as post-operatively it is difficult to differentiate the confusion states possibly arising from pain, metabolic disturbances, electrolyte derangements, residual effects of general anaesthetics and hypoxia. The psychotropic, anti-epileptic and anti-Parkinsonian drugs for maintaining stable neurological function should be continued during peri-operative period. Pre-operative delirium and dementia, which are invariably present in 34–92% of geriatric population with hip fractures is associated with poor functional recovery.[26]

**Pre-op renal assessment**

Peri-operative acute kidney injury/acute renal failure are independent predictors of post-operative morbidity, particularly if these patients have pre-operative renal impairment.[25,26] However, presence of other co-morbidities such as age >60 years, emergency surgery, hepatic dysfunction, body mass index (BMI) >32 kg/m², obstructive airway disease, peripheral vascular disease can also cause possible renal insults during peri-operative period.[27] Diagnosis of pre-operative renal impairment in geriatric population is tricky as creatinine clearance decreases by 1% with each passing year, which is not always associated with increase in serum creatinine.[28,29] Estimation of glomerular filtration rate (GFR) by Cockcroft and Gault formula and MDRD equation are better indicators of renal functions. Peri-operative protection has been made easy with new upcoming biomarkers of acute kidney injury, which include cystatin, kidney injury molecule-1, neutrophil gelatinase-associated lipocalcin and others.[27,30] Peri-operative renal protection strategies include avoidance of nephrotoxic drugs, prevention of hypovolemia and hypotension, metabolic derangements, electrolyte imbalances, maintenance of optimal GFR, normovolemia, judicious use of anesthetics, narcotics and analgesics and peri-operative measurement of urinary output.[27,31] Gastrointestinal function evaluation

Peri-operative opioid use either neuraxial or systemically should be done with caution as these patients have decreased gut motility due to aging and presence of autonomic neuropathy of diabetes mellitus (DM), which is widely prevalent in majority of these patients.[32] Diminished hepatic function may lead to altered metabolism and decreased clearance of various anesthetic drugs including morphine, fentanyl and ketamine.[23]

**Endocrinopathies complicating surgeries**

Endocrine anesthesia is a new emerging specialty and DM is a major endocrine disorder, which is being encountered with increasing frequency in day-to-day anesthesiological practice.[34,35] Complications such as hyperglycemia, hypoglycemia, electrolyte imbalance, dehydration, congestive cardiac failure, wound infection and those related to other systemic organs shows increase incidence of higher mortality in elderly patients. Pre-operative risk evaluation include assessment of
chronological age of DM, renal functions, cardiac evaluation, Hb1Ac estimation, electrolyte and metabolic profile assessment so as to formulate appropriate anesthetic plan.[36] Recommendations proposed by American association of Clinical Endocrinologists/American Diabetic Association (AACE/ADA) include keeping of blood glucose (BG) between 140–180 mg/dl during hospital stay[37] and avoiding a level below 80 mg/dl.[36] Presence of thyroid pathology, pituitary disease, adrenal insufficiency and other endocrine disorders mandates as much emergency optimization as possible before any emergency orthopedic surgery.[38-42]

**Decisive role of nutritional status**
Malnutrition is usually prevalent in 30–50% of elderly patients but nutritional status of elderly is generally overlooked during pre-anesthetic assessment and optimization.[42-46] Nutritional deficiencies may be the precipitating risk factors of various peri-operative complications including respiratory failure, pharmacokinetic and pharmacodynamic alterations, infections and impaired wound healing, prolonged intubation, poor recovery and higher morbidity and mortality.[43-47] Pre-operative nutritional assessment in elderly should be done fairly to improve surgical outcome.[43-47]

**PAIN RELIEF**
Inadequate pain relief can be highly detrimental as it can possibly cause delirium, restlessness, accentuation of underlying cardio-respiratory disease, cognitive dysfunction, depression, poor oral intake, decreased functional independence, increased length of hospital stay, economic burden and an overall poor surgical outcome [Table 2].[48] These clinical scenarios probably occur due to lack of awareness of pain perception mechanisms and failure to completely follow recommended guidelines for relief of pain.[49]

**Measures to relief pre-operative pain**
Besides non-steroidal anti-inflammatory drugs (NSAIDs) and narcotics, nerve blocks have been increasingly used for pre-operative pain relief. Introduction of ultrasonography (USG) into anesthesiological practice has made the regional blocks much safer in trauma patients, which can provide effective pain relief, pre-operative, intra-operative and during post-operative period. Newer safer local anesthetics like ropivacaine and levobupivacaine can provide effective analgesia during manipulation of fractures.[50,51] Femoral nerve block and 3-in-1 block under USG guidance provides faster analgesia with lower doses of local anesthetics,[52] Fracture of forearm can be managed by hematoma block or Bier’s block besides systemic analgesia.[53]

**SOCIO-BEHAVIORAL AND BIOPSYCHOSOCIAL PERSPECTIVES**
Pre-operative functional state, socio-behavioral status, biopsychological perspectives and social support network are important aspects, which can prove decisive in surgical outcome.[54] Neuro-behavioral, cognitive and social support are extremely important for rehabilitation.[55] The covered facies of operation theater personals, sound of sophisticated electronic gadgets, strange surroundings, sound of surgical instruments and an awake state during regional anesthesia can generate panic among many geriatric patients. Anesthetic strategies should be developed to enhance the patient experience and satisfaction during peri-operative period. Even if pre-operative pain relief is provided, delay should not be done at this stage as risk of pressure ulcers, thromboembolism and pneumonia increase manifold besides increased mortality.[55,56]

**EMERGENCY PREPARATION FOR ORTHOPAEDIC SURGERY**
Thorough assessment during emergency orthopedic surgery is not always feasible in entirety but attempts should be made for optimization of co-morbidities and stratification of risks associated with such surgeries to develop multifaceted therapeutic interventions.[57]

Evidence based accelerated protocols for emergency orthopedic surgery in geriatric include pre-operative nerve blocks to relieve pain, involvement of anesthesiologist during early stage, nutritional assessment and optimization whenever feasible, optimization of hydration status, monitoring and assessment of urinary function and respiratory function [Table 3].[58] These measures taken in entirety significantly that help in early discharge, decreased post-operative complications and decreased mortality.[59] The incidence of post-operative delirium is higher, if such patients have pre-operative cognitive dysfunction, infections, undue delay in surgery, indoor injury and BMI < 20.[60] Strategies aimed at optimizing post-operative management should include nursing education, pre-operative screening by
nurses, post-operative pain management, use of regional anesthesia, early rehabilitation, multidisciplinary treatment and optimizing respiratory status, pro-active geriatric consultation, O₂ therapy and avoiding peri-op hypotension. Pre-operative analgesia through systemic analgesics and blocks may decrease the severity of pain but makes the patient highly vulnerable to development of orthostatic hypotension and drug induced cognitive dysfunction during possible ambulation.¹⁶²

ASSOCIATED ORGAN SPECIFIC INJURIES

Head injury
The mortality in geriatric patients with head injuries increases linearly with each passing year.¹⁶³ Injury mechanisms may be subtle or mild with hardly any evidence of neurological signs or symptoms but during radiologic investigations one may observe significant hematomas subdurally or epidurally.¹⁶⁴ Mortality also increases from intracranial hemorrhage if such patients are taking anti-coagulants.¹⁶⁵ Serial computed tomography (CT) scan is the ideal monitoring investigations in such patients even if injury seems to be occult in the beginning.¹⁶⁴ Management of such injuries is further compounded by poor auto regulatory mechanisms.

Even cervical spine injury in elderly can have out of proportion symptomatology due to presence of underlying cervical stenosis and degenerative diseases of the spine.¹⁶⁶ This necessitates a careful examination in all the elderly trauma victims to take appropriate measures to prevent further damage.

Injuries to thorax can be dangerous in elderly as more than 3 undisplaced fractures can be associated with higher morbidity and mortality.¹⁶⁷ Rib injuries can prove fatal if

the patient sustains pulmonary contusions and develop pneumonia due to lower cardio-respiratory reserve.¹⁶⁸ Pelvic fracture in the elderly poses unique challenges, as besides causing hemorrhage, they are associated with higher complications. The volume of hemorrhage may not be apparent, and therefore, angiography seems a necessary option in such population.¹⁶⁹

Orthopedicians need to share decisions considering the risks of anesthesia to approach the patient with splint or cast option or to go for the operative intervention.⁷⁰

CHOOSING ANESTHETIC TECHNIQUE

Anaesthetic technique is basically decided on an individual basis as there is no literary evidence, which can confirm the superiory of one technique over the other. Lower extremity orthopedic surgery can be performed under general, spinal or epidural anesthesia, and often a combination of techniques is used. There is no evidence of a difference in mortality between the techniques.¹⁷¹ However, regional anesthesia is generally preferred as it has significant advantages over general anesthesia, which may include but are not limited to reduced blood loss during surgery and thereby a decrease need for any transfusion and its related hazards, decreased bleeding at the operative site, improved cement bonding and shorter surgical time.¹⁷² Also, a decreased incidence of DVT and PE possibly decreases pulmonary function morbidity by avoiding the effects of GA, better post-operative analgesia and lesser costs, which are few other beneficial effects of regional over GA.¹⁷³

However, merits of general anesthesia cannot be denied as it can be potentially useful in certain clinical situations such as cardiac patients with fixed cardiac output as in aortic stenosis, positioning difficulties in supine position, patients' refusal for regional anesthesia and many others.

Anesthetic management during peri-operative period
It is preferable to secure intravenous (IV) line with a wide bore cannula for possible blood transfusion during surgery and antibiotic prophylaxis should be administered at least one hour before surgery. For all geriatric orthopedic procedures, minimum mandatory monitoring should include blood pressure (usually non-invasive), electrocardiogram (ECG), temperature and pulse oximetry. However, when GA is administered, it is essential to continuously monitor end-tidal CO₂ percentage of inhalational anesthetic delivered and respiratory dynamics. Temperature can be maintained with forced air warmers and administering warm IV fluids. Blood can be transfused depending upon the peri-operative losses and pre-operative hematocrit values. Volume status should be optimized before

| Table 3: Accelerated protocols and strategies for optimizing post-op management during emergency orthopedic surgery |
|-------------------------------|-----------------|------------------|
| **Pre-op interventions**      | **Merits**      | **Strategies for optimizing post-op management**          |
| Pre-op nerve blocks to release pain | Early discharge, decreased post-op complications and decreased mortality | Nursing education |
| Involvement of anaesthesiologist during early stage | | Pre-op screening by nurses |
| Nutritional assessment and optimization whenever feasible | | Post-op pain management |
| Optimization of hydration status | | Use of regional anaesthesia |
| Monitoring and assessment of urinary function | | Early rehabilitation |
| Monitoring and assessment of respiratory function | | Multidisciplinary treatment |
|                               |                 | Optimizing respiratory status |
|                               |                 | Pro-active geriatric consultation |
|                               |                 | O₂ therapy and avoiding peri-op hypotension |
cementing procedure. Injuries during positioning should be prevented by padding and avoiding over compression of the dependent structures.\textsuperscript{[71‑73]}

During subarachnoid block, opiates may be added for more prolonged analgesia and to cover longer surgery (up to 3 hours). However, there is a potential risk of delayed respiratory depression postoperatively.\textsuperscript{[71‑73]} Nowadays, \(\alpha-2\) agonists such as dexmedetomidine and clonidine are increasingly being used for RA. Not only do these adjuvants prolong the post-operative analgesia, they also simultaneously decrease the dose of local anesthetic required for achieving the anesthetic effect besides providing desirable sedation.\textsuperscript{[74‑79]} Propofol and midazolam are commonly used for providing peri-operative sedation. Patients in the lateral position may become restless and uncomfortable because of pain arising from the dependant shoulder.

General anaesthesia can be administered with laryngeal mask airway (LMA) and maintain spontaneous ventilation for shorter procedures but requires endotracheal intubation for prolonged procedures. For lower extremities, epidural analgesia may be considered for longer and more complex surgery and for providing post-operative analgesia; but it necessitates insertion of a urinary catheter in most patients. Nerve blocks can be administered for supplementing analgesia, which can also potentially reduce the doses of anaesthesia drugs and opioids. IM or oral opioids can also be administered for breakthrough analgesia supplemented with NSAIDs and paracetamol. Administration of patient-controlled analgesia (PCA) largely depends upon the intellectual and intact cognitive behaviour. Close fluid intake and output monitoring is highly essential as dynamic fluid shifts in the elderly can be detrimental and are associated with poor surgical outcome.\textsuperscript{[71‑73]}

**CONCLUSION**

Apart from evaluating clinical co-morbidities, socio-behavioral, cognitive and psychological assessments, it is essential to provide optimum emergency orthopedic care as we make large leaps towards advancements in geriatric anesthesia. Providing a pleasant peri-operative experience and satisfaction, besides achieving clinical efficiency during emergency orthopedic surgery, are the goals and fundamentals of bio-psychosocial care model during emergency orthopedic surgery. Practiced in entirety, these aspects will definitely help in improving our basic understanding of geriatric physiology, psychology and clinical knowledge, which will provide new horizons for improvements in research and practical usefulness of geriatric anesthesia.
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