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Shoulder arthroscopy and complications: Can we afford to relax?

Shoulder arthroscopy is a minimally invasive technique used for diagnostic and therapeutic indications related to rotator cuff tear, recurrent joint instability and sub-acromial pathology. It is associated with benefits such as lesser post-operative pain and early rehabilitation as compared to open techniques. More than 1.4 million shoulder arthroscopies are carried out each year reflecting the popularity of the technique.^[1] Recent evidences, however, have increasingly focussed on complications related to use of irrigation fluid, patient positioning and anaesthesia during shoulder arthroscopy.^[2] Knowledge about the mechanisms involved in these complications can result in their early detection, prevention and effective management.

Extravasation of irrigation fluid can be disastrous with extensive subcutaneous emphysema, pneumomediastinum, tension pneumothorax, air embolism, airway oedema and tracheal compression.^[3,4] Risk increases with protracted duration of surgery, sub-acromial pathology, large volume of irrigation fluids, increased pump pressures and obesity. The fluid accumulation may contribute to weight gain, drop in haemoglobin and haematocrit and other systemic effects. The resorption takes around 12 h and persistent effects during this period may not be well tolerated by the elderly.^[5] A case series on changes in neck circumference published in this issue of IJA^[6] highlights the six factors responsible for increased risk of airway oedema, namely sub-acromial procedures, lateral decubitus position (LDP), increased duration of surgery, loose connective tissue, intraoperative hypertension and excessive pump pressures. Multiple regression analysis for these risk factors showed intraoperative hypertension as a single predictor for

the increase in neck circumference (>4cm) and its relation to airway compromise.

Complications have been found to be less with an experienced surgeon, lesser surgical duration, use of controlled pump pressures and controlled flow rate of irrigation fluids (range 40–80 mmHg and 50–150 ml/min, respectively) with continuous outflow conduit and providing general anaesthesia (airway secured) with deliberate hypotensive anaesthesia in selected patients.^[7] The risk of airway obstruction can be anticipated and minimised by intraoperative monitoring of increased airway pressure and compliance, monitoring for increase in neck circumference post-operatively, a positive cuff leak test (absence of leak) with endotracheal cuff deflation at end of procedure, checking for airway oedema on direct laryngoscopy or bronchoscopy and ultrasound observation of fluid infiltration.^[8-10]

Lateral decubitus position and beach chair position (BCP) offer unique benefits to the surgeons and overall, there is no evidence to show the superiority of one position over the other in this respect.^[11] However, LDP is more likely to be associated with traction injuries and direct nerve injuries.^[2] Gravitational influence contributes to extravasated fluid related airway compromise in LDP.^[12] Avoidance of positions of extreme neck flexion and inadvertent cervical extension, pre-operative head padding and frequent head/neck position checks throughout the procedure can prevent morbidity. Monitoring of haemodynamics and cerebral perfusion pressures are essential for arthroscopies in BCP. Hypotensive anaesthesia in this position should be used with caution in elderly patients and those with elevated resting

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blood pressure. The incidence of hypotension and bradycardia event (HBE) (4–29%) is under-reported and can lead to devastating complications, including cardiac arrest.^[2] The combination of venous pooling and paradoxical increased vagal tone (activation of Bezold–Jarisch reflex) results in sudden, profound bradycardia and hypotension that can be difficult to reverse rapidly. HBE can be prevented by aggressive treatment of fluid deficits and blood loss, avoiding adrenaline during skin infiltration or interscalene block and prophylactic use of β adrenergic blockers like metoprolol.^[2] Bezold–Jarisch reflex can also be triggered by activation of 5HT₃ receptors. Srinivasa Rao Nallam *et al.*, in their study published in this issue of IJA,^[13] report that pre-treatment with intravenous ondansetron (5HT₃ receptors blocker) reduces the incidence of HBE when interscalene brachial block and sitting position were used in shoulder arthroscopy.

Regional anaesthesia with interscalene or supraclavicular brachial plexus block have the benefits of lesser anaesthetic use intraoperatively, less analgesia requirement and less incidence of nausea and vomiting post-operatively and reduced hospital stay.^[14] HBEs with interscalene brachial blocks and cerebral hypoperfusion events, cervical neuropraxia (lesser occipital nerve, greater auricular nerve, hypoglossal nerve), air embolism and pneumothorax have been reported with BCP.^[2] Liu *et al.* found that ultrasound-guided interscalene and supraclavicular blocks are effective and safe for ambulatory shoulder surgery.^[15] The use of general anaesthesia with endotracheal intubation ensures adequate airway control when longer duration surgeries are performed in BCP/LDP. Combined use of general anaesthesia and intraoperative or post-operative brachial blocks provides better control of vital signs, airway protection and post-operative pain.^[10,16]

Morrison *et al.* found that an average pressure difference of 49 mmHg between systolic blood pressure (SBP) and subacromial space, was sufficient to provide adequate visualisation.^[17] Despite maintaining systemic mean arterial pressure within 20% of baseline values, near infrared spectroscopy (NIRS) showed a significant reduction in regional cerebral oxygen supply more in BCP than LDP.^[18,19] Careful and attentive monitoring of SBP (referenced to the level of the brain) and vigilant maintenance of adequate cerebral perfusion pressure are essential for any surgery performed with the patient in BCP. Obtaining a blood pressure measurement at the contralateral upper extremity

and adjusting for the difference in height between the point of measurement (arm) and the head is a must for surgeries performed in LDP.

Advances in minimally invasive techniques have contributed significantly to greater flexibility and efficacy in addressing shoulder pathology. It has also extended its benefits to ambulatory surgery and high-risk patients. Cerebral oximetry with NIRS may provide non-invasive, inexpensive and continuous assessment of cerebral perfusion alerting before irreversible cerebral ischaemia occurs. Surgeon experience and restriction of surgical time, patient positioning, minimising arthroscopic pump pressures, limiting amount of irrigation fluid, using deliberate hypotensive anaesthesia in selected patients and proper instrumentation can improve technical success and can relax the surgeon, as well as the anaesthesiologist!

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