



EFFECT OF IRRIGATION FLUID IN SHOULDER ARTHROSCOPIC SURGERY

Anaesthesiology

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ABSTRACT

Introduction: Shoulder arthroscopy is minimal invasive procedure in which irrigation fluid is used under pressure to distend the joint space and enhance the visualization. This irrigation fluid can migrate into the adjacent tissues and systemic circulation, which can lead to the airway edema, tracheal compression and systemic fluid overload. This study is conducted to measure the changes in anthropometric parameters, which can predict airway or respiratory compromise in shoulder arthroscopy.

Aims And Objectives: To assess the effect of irrigation fluid absorption on measurable anthropometric parameters and associated respiratory compromise.

Materials And Methodology: This is a prospective observational study conducted on 60 patients between 15 to 60 year of age ASA grade I and II. Standard general anaesthesia was given and intra operative hemodynamic parameters were noted. Pre and post operative variable measures like neck, chest, mid arm and mid-thigh circumference were noted.

Observation And Results: Intraoperative neck, chest and mid arm circumference increase from 44 to 45.5 cm, 86.2 to 87.9 cm and 23.2 to 24.4 cm respectively. Haemoglobin has been reduced from 14.1 to 13.3 mg/dl.

Conclusion: There is statistically significant increase in neck, chest and mid arm circumference

KEYWORDS

INTRODUCTION

Shoulder arthroscopy is a minimal invasive procedure done with the help of arthroscopy to examine and repair the tissues inside or around the shoulder joint. Irrigation fluid under pressure is used to distend the joint space and enhance visualization, which has the potential to migrate into adjacent soft tissues and systemic circulation leading to complication like airway edema and tracheal compression.

Risk factors associated with the extravasation of irrigation fluids are duration of surgical procedure increased arthroscopic pump pressure and flow rate, use of excessive amount of irrigation fluid, procedure involving the sub acromial space, lateral decubitus position and obesity.

Various means of measuring this tracheal compression are measurement of neck circumference (pre-operative and post-operative), monitoring airway pressure and compliance, absence of cough leak with endotracheal cough deflation, airway edema on direct laryngoscopy/ fiber optic bronchoscopy, ultrasound observation of tissue fluid infiltration and soft tissue enlargement on chest and lateral cervical x ray.

MATERIALS AND METHOD

This observational prospective study includes 60 patients who underwent shoulder arthroscopy under general anaesthesia at B. J. Medical College, Civil hospital, Ahmedabad between October 2019 to October 2020.

All surgical procedure were performed under general anaesthesia.

• Premedication

Inj. Glycopyrrolate 0.004 mg/kg IV

Inj. Ondansetron 0.15 mg/kg IV

Inj. Fentanyl 2 µg/kg IV

Preoxygenation with 100% O₂ for 3 to 5 minute via Bain's circuit with flow at 8 to 10 L/min.

• Induction

IV induction agent: Inj. Propofol 2-3 mg/kg IV

NM blocking agent: Inj. Succinylcholine 2 mg/kg IV

Patients were intubated using appropriate sized endotracheal tube and were mechanically ventilated at a frequency of 12-14 breaths/minute with tidal volume of 8-10 ml/kg.

• Maintenance

Sevoflurane + O₂

Inj. Atracurium 0.5 mg/kg (Loading) and 0.15 mg/kg (Intermittently) IV

All patients were positioned in lateral decubitus position with operative arm in 30-45° abduction and forward flexion.

Normal saline was used as irrigation fluid at 40 to 80 mmHg pump pressure and 50 to 150 ml/minute fluid.

The measured variable pre-operatively and at the end of surgery were neck, chest, mid arm, mid thigh circumference (cm), weight (kg), haemoglobin (gm/dl) and serum sodium (mEq/L). Intra-operatively ECG, NIBP, SPO₂, EtCO₂ and temperature were recorded.

• Reversal

Inj. Glycopyrrolate 0.008 mg/kg IV and Inj. Neostigmine 0.05 mg/kg IV were administered to reverse neuromuscular blockage at and of surgery and Extubation was done.

Subjective feeling of breathlessness, tightness in the neck, the chest retraction, increase in respiratory rate, cyanosis and decrease in SPO₂ <90% were used as indicator of airway compromise.

STATISTICAL ANALYSIS:

Data were analyzed using MS office excel 2016 and SPSS software version 20.0. Quantitative data were expressed as mean ± SD and Z test was used. Categorical and Nominal data were expressed in percentage.

OBSERVATION:

In this study mean age of patient was 41 ± 8.6 years, 45/60 males and 15/60 females with 3:1 male : female ration with ASA physical status in 40/60 grade I and 20/60 grade II.

Major indications of surgery are torn rotator cuff (23.3%), frozen shoulder (15%), torn biceps tendon (10%), arthritis clavicle end (9.5%) and other minor diagnosis were stiffness of shoulder (10%), damaged cartilage ring (10%), supra –infra spinatous tear (6.6%) and instability evaluation (6.6%).

Table 1. Haemodynamic Variables

Vitals	Pre-op	Intra-op	Post-op
Pulse	76.8 ± 7.3	84 ± 7.4	77.1 ± 6.2
Temperature	36.6 ± 0.2	36.3 ± 0.2	36 ± 0.3
BP	$120/75 \pm 8/5$	$132/84 \pm 8/6$	$119/78 \pm 7/5$
RR	14.5 ± 1.2	12 ± 0	14.4 ± 1.2
SpO ₂	99 ± 0.7	99 ± 0.6	99.2 ± 0.6

Table 2. Comparison Of Pre-op And Post-op Variables Among Study Participants (N=60)

Measurement	Pre-op	Post-op	p-value
Hb	14.1 ± 1.3	13.3 ± 1.4	0.002
Neck circumference	44 ± 4.8	45.5 ± 4.8	0.08
Chest Circumference	86.2 ± 2.8	87.9 ± 3.4	0.003
Mid arm circumference	23.2 ± 1.6	24.4 ± 1.7	<0.001
Mid-thigh circumference	59.2 ± 3.9	59.5 ± 4	0.67
Weight	63.6 ± 7	65.2 ± 7.3	0.22
S. Sodium	138.7 ± 2.6	138.1 ± 2.6	0.20

Table 3. Distribution Of Study Subjects According To Intra-operative Variables

Intra-op measurement	Mean	SD
IV fluids(ml)	1225	218.3
U/O (ml)	579.1	145.8
Irrigation fluid usage (L)	18.8	4
EtCO ₂	30.5	1.8
Anaesthesia duration (minute)	115	15.6

DISCUSSION:

In this study the irrigation fluid used in shoulder arthroscopy an extravasate into adjoining soft tissues and can leads to laryngeal, facial and neck edema, extensive swelling across the chest which can even require reintubation and mechanical ventilation post operatively.

Intra operatively pulse rate varied from 76.8 ± 7.3 to 84 ± 7.4 , temperature 36.6 ± 0.2 to 36.2 ± 0.3 . Blood pressure variation noted from 120/75 to 132/84 during procedure which returned to 119/78 after surgery. No fluctuation noted in RR and SpO₂. Warming of irrigation fluid which can prevent hypothermia that can aggravate respiratory compromise in patient with airway obstruction post operatively.

There is statistically significant reduction in hemoglobin noted from 14.1 to 13.3 gm/dl, increase in neck circumference from 44 to 45.5 cm, chest circumference increased from 23.2 cm to 24.4cm. There is no statistically significant increase in thigh circumference, increase of weight and decline in serum sodium level.

In study conducted by Gupta S et al. found significant increase in patients neck, chest, mid arm and mid-thigh circumference. Neck circumference beyond 4 cm suggest to look for airway compromise. Absorption of irrigation fluid can increase thigh circumference and can lead to haemodilution and decrease in haemoglobin.

Gupta S et al. observed weight gain of 1.17 ± 0.37 kg with significantly correlate mean duration of surgery (189.17 ± 85.63 minute) and amount of irrigation fluid used (24.63 ± 13.45 L). Excessive weight gain indicate retention of fluid which is not tolerated by elderly and/or cardiac and renal disease patients. In our study maximum 1.5 kg weight gain observed.

In our study, average IV fluid used was 1225 ml, urine output 579.1 ml and irrigation fluid used was 18.8L with anaesthesia duration of

150 ± 15.6 minute. In our study, normal saline was used as irrigation fluid which maintained serum sodium level. Irrigation fluid like glycerin, ringer lactate can alter acid-base balance and electrolytes level.

There is no significant change in RR, EtCO₂ and SpO₂ without any airway compromise. To evaluate possibility of compromise in airway, ideal measures are neck circumference, airway pressure/ compliances, absence of ETT cuff leak with cuff deflation, airway edema on direct laryngoscopy/ fiberoptic bronchoscopy, ultrasound observation of tissue fluid infiltration and soft tissue enlargement on chest and lateral and cervical neck x-ray.

CONCLUSION

It is concluded from the study that neck, chest and mid arm circumference and haemoglobin are significantly altered due to irrigation fluid with no changes in mid-thigh circumference, weight and serum sodium level. Total amount of irrigation fluid used and total duration of surgery have impact on airway compression and subsequent respiratory complication.

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