

## Unilateral Pulmonary Edema After Fracture Humerus Surgery: Case Report

Magdy Imam Abdel Aleem Taha\*

Consultant of anesthesia, Saqr Hospital, RAK-UAE

**Abstract**

Pulmonary edema can occur due to variety of causes in surgical patient including congestive cardiac failure, its unilateral presentation being rare. We present a case with fracture midshaft humerus who developed unilateral pulmonary edema (lower lung syndrome) as a postoperative complication of prolonged surgery in lateral decubitus position with excess intraoperative fluid resuscitation. The condition was diagnosed clinically and radiographically and managed with a satisfactory clinical outcome. The risk factors, pathophysiology, differential diagnosis of this uncommon condition is discussed.

**Keywords:** Unilateral Pulmonary Edema; Lateral Decubitus Position; Unilateral Chest Infiltrate

**Introduction**

In lateral decubitus under general anesthesia and muscle relaxation, the dependent lung receives relatively more perfusion than the nondependent lung, However, most of the ventilation is switched to the nondependent lung which results in mismatching of ventilation and perfusion. our case report shows that unilateral pulmonary edema and atelectasis can also occur as complications of the lateral decubitus position especially in prolonged surgery (6hr) associated with large fluid resuscitation.

**Case Report**

Our case is 32 years male patient, motor vehicle accident came to emergency department with Glasco coma scale 7/15. Trauma CT shows splenic injury, left frontal brain contusion, fracture left zygoma, orbital roof, maxilla fracture and fracture middle shaft left humerus. After resuscitation and tracheal intubation, he was immediately shifted to the operating theater for urgent splenectomy which done un eventually and shifted back to the ICU sedated with dexmedetomidine infusion (0.07 µg / kg / hr) and fentanyl infusion (1µg / kg / hr) on mechanical ventilation, hemodynamically stable and patient was scheduled on next day for fixation of the left mid shaft humerus fracture in right lateral decubitus position. Next day preoperatively he was hemodynamically stable, mechanically ventilated and sedated with dexmedetomidine and fentanyl infusion, with good blood gases and insignificant chest x ray finding (Figure 1), laboratory examination did not reveal any significant abnormality except hypoalbuminemia (2 g/dl).

The patient was shifted to the theater where 3 lead electrocardiography (ECG), pulse oximetry and noninvasive blood pressure monitoring were started. Balanced anesthesia was induced using, propofol 100mg, rocuronium 40mg, fentanyl infusion was continued, and the dexmedetomidine infusion was stopped. Patient was given right lateral decubitus position for surgery and total time in this position was 6½ hours. The General anesthesia was maintained with sevoflurane 1% to 1.5% and fentanyl infusion and rocuronium

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\***Corresponding Author:** Dr. Magdy Imam Abdel Aleem Taha, Consultant of anesthesia, Saqr Hospital, RAK-UAE. Email: [doctormagdy71@gmail.com](mailto:doctormagdy71@gmail.com)

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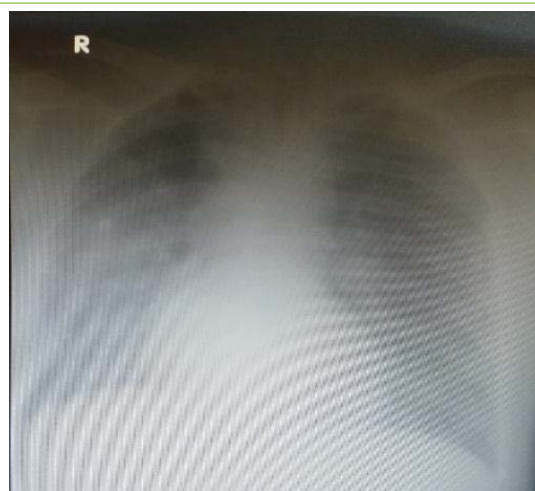
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**Figure 1:** Pre-operative chest x-ray: no significant abnormality.



**Figure 2:** Immediate post-operative chest x-ray: show unilateral pulmonary edema.



**Figure 3:** Chest x-rays after 24 hours show: marked improvement.

incremental doses as required, continuous monitoring with ECG, SpO<sub>2</sub>, EtCO<sub>2</sub>, NIBP, airway pressure and urine output, was performed. patient was hydrated with estimated 4 L of fluids which included 3.5L of lactated Ringer's solution and ≈ 400 ml of packed red blood cell. Estimated blood loss was about 800 ml, the total intraoperative urine output was 1.5L. after 6 hours in lateral position, patient's saturation fell from 100% to 95%, the proximal airway pressure was increased from 20 cmH<sub>2</sub>O to 26 cmH<sub>2</sub>O. On examination of the chest, fine crepitations in dependent lung were audible, no hemodynamic consequences followed as the blood pressure and heart rate were maintained.

By end of operation he was shifted back to the ICU hemodynamically stable with BP around 110/65mmHg, HR between 90 and 100/min, intubated and sedated with SpO<sub>2</sub> 95-97%, The post-operative chest x ray reveals unilateral pulmonary edema (Figure 2). The lungs were ventilated with Synchronized Intermittent Mandatory Ventilation (SIMV) mode, PEEP 8 cmH<sub>2</sub>O and Pressure Support (PS) 10 cmH<sub>2</sub>O, FiO<sub>2</sub> 0.40, air entry continued to improve over the next few hours over the right lung, with improvement of saturation back to 100%. After 24 hours bilateral air entry was present, and chest X-ray showed marked improvement of aeration (Figure 3) ABG was normalized and the patient was extubated after clinical and radiological improvement.

## Discussion

Lateral decubitus is a routinely used position for mid shaft humerus fracture surgery in our hospital. Unilateral dependent pulmonary edema has been reported in lateral position under general anesthesia during some surgical operation like laparoscopic donor nephrectomy, nephrectomy for renal cell carcinoma and urological surgery [1] but up to our knowledge not reported before in healthy adult orthopedic patient in lateral position under general anesthesia. Pulmonary edema is rarely unilateral and may cause confusion also presents diagnostic challenges [2]. The development of pulmonary edema is the result of complex mechanisms. The force, which tends to push fluid out of the capillaries, is the capillary hydrostatic pressure and less the hydrostatic pressure of the interstitial fluid. The force tending to keep fluid in the capillaries is the osmotic pressure of blood proteins and less that of the proteins in the interstitial fluid (Starling forces). When the balance of these factors is altered, fluid passes from the pulmonary capillaries to the interstitial spaces - and, when the capacity of lymphatics in the lung interstitium is exceeded, to the alveolar spaces [2,3].

Common differential diagnosis of desaturation and increase peak air way pressure in lateral decubitus position under general anesthesia in our case includes aspiration, atelectasis, bronchospasm, anaphylaxis, cardiac, neurogenic, pneumothorax, fat embolization [4]. Unilateral dependent pulmonary edema (lower lung syndrome) is a rare cause of intraoperative desaturation in patients in lateral position [5], the diagnosis in our case was made retrospectively on postoperative chest x ray after excluding all other causes.

Aspiration of gastric contents into the dependent lung was unlikely possibility due to presence of Nasogastric tube, long NPO status of the patient and presence of cuffed endotracheal tube. Unilateral pulmonary edema and atelectasis due to obstructed breathing is common with inadvertent single lung intubation [6]. In our patient the possibility of improper placement of endotracheal tube was unlikely because there was no evidence of obstructed breathing throughout the procedure, bilateral breath sound was confirmed by auscultation after placement of lateral position, end tidal carbon dioxide trace, and tidal/minute ventilation remained normal throughout the procedure. Unilateral bronchospasm per se is known but is a rare entity [7]. Many of the reports describing unilateral bronchospasm are found in anesthesia literature mainly following interpleural analgesia. It also has been rarely reported after subclavian vein puncture, pleurodesis, neuroradiologic intervention and during airway manipulation with inadvertent topical lignocaine injection into the left bronchus with a Laryngojet anaphylaxis [7,8]. In this case the clinical picture and unilateral infiltration in post-operative chest x-ray not match with bronchospasm or anaphylaxis.

Unilateral pulmonary edema has been reported after congestive heart failure, with prolonged rest on one side in patients with cardiac decompensation. However, it is mainly reported in association with severe mitral regurgitation [9,10]. Unilateral pulmonary edema following acute intraoperative cardiac event was unlikely due to stable hemodynamics intraoperatively, no ECG changes. Neurogenic pulmonary edema is a potential complication of central nervous system insults such as intracranial hemorrhage, uncontrolled generalized seizures, head trauma, tumors and neurosurgical procedures [11], they result in cardiopulmonary sequelae because of the interplay between enhanced sympathetic tone and inflammatory cytokine release [12]. The clinical picture in our case go against this diagnosis.

Fat embolism have also been reported but it is extremely rare in upper limb fracture [13]. The absence of other clinical findings of fat embolism goes against the diagnosis, and finally pneumothorax excluded by chest x-ray.

Several factors can contribute toward the development of unilateral pulmonary edema, during lateral decubitus position under general anesthesia with controlled ventilation, the dependent lung is relatively hyperperfused and hypo ventilated compared with the nondependent lung. Dependent lung hypoventilation results from upward displacement of the dependent hemi-diaphragm by abdominal organs, Increased perfusion of the dependent lung results in increased pulmonary capillary pressures with fluid transudation according to Starling's equation. Unilateral impairment of lymphatic drainage has also been

implicated. Operations in which the patient is in the lateral decubitus position for  $\geq 5$  h with high fluid requirement is an independent risk factor for unilateral dependent pulmonary edema [14]. Our patient had many risk factors namely prolonged lateral decubitus position, excess fluid management and hypoalbuminemia.

In conclusion, unilateral dependent pulmonary edema (down lung syndrome) is a rare cause of unilateral infiltrates on chest x-ray. It is important that anesthesiologists be aware of the possibility of unilateral pulmonary edema in any prolonged surgical procedures performed in lateral decubitus position. It is a diagnosis of exclusion after all the common causes have been considered. A high index of suspicion is necessary, the key lies in the early onset of radiologic findings.

## References

1. Modi M, Shah V, Modi P (2009) Unilateral dependent pulmonary edema during laparoscopic donor nephrectomy: Report of three cases. *Indian J Anaesth* 53: 475-477.
2. Garvi J Pandya, Amartya Mukhopadhyay, Chua Ai Ping, Tow Keang Lim (2012) Unilateral Lobar Pulmonary Edema: case report. *JAPI* 60.
3. Robin ED, Cross CE, Zelis R (1973) Pulmonary edema: *New England Journal of Medicine* 288: 292-304.
4. Snoy FJ, Woodside JR (1984) Unilateral pulmonary oedema (down lung syndrome) following urological operation. *J Urol* 132: 776-777.
5. M Narayanan, S Sambandam (2007) Unilateral Pulmonary Oedema Following Total Hip Arthroplasty. *The Internet Journal of Anesthesiology* 18: 2.
6. Young-Chang P Arai, Jun Kawanishi, Sakakima Y, Ohmoto K, Ito A, et al. (2016) Respiratory Event Initially Thought to be Inadvertent Endobronchial Intubation: Possible Complications From Using of a Topical Metered-Dose of 8% Lidocaine Pump Spray. *Anesth Pain Med* 6: e33771.
7. Reddy K, Prabhakar H, Yadav N, Singh GP, Ali Z (2010) Unilateral bronchospasm during microcatheter manipulation in an interventional neuroradiology suite. *J Anesth* 24: 313-314
8. Farmery AD (2000) Severe unilateral bronchospasm mimicking inadvertent endobronchial intubation: A complication of the use of a topical lidocaine laryngojet injector. *Br J Anaesth* 85: 917-919.
9. Handagala, Udaya Ralapanawa (2018) Unilateral pulmonary edema: a case report and review of the literature. *Journal of Medical Case Reports* 12: 219
10. Legriél S, Tremey B, Mentec H (2006) Unilateral pulmonary edema related to massive mitral insufficiency. *Am J Emerg Med* 24: 372.
11. Pyeron AM (2001) Respiratory failure in the neurological patient: The diagnosis of neurogenic pulmonary edema. *J Neurosci Nurs* 33: 203-207.
12. Smith WS, Matthay MA (1997) Evidence for a hydrostatic mechanism in human neurogenic pulmonary edema. *Chest* 111: 1326-1333.
13. Kosova E, Bergmark B, Piazza G (2015) Fat embolism syndrome. *Circulation* 131: 317-320.
14. Leeming BW (1973) Gravitational edema of the lungs observed during assisted respiration. *Chest* 64: 719-22.