

## **Status asthmaticus coming for strangulated inguinal hernia**

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### **Introduction:**

Status asthmaticus (SA) is a condition of progressively worsening bronchospasm and respiratory dysfunction in a patient with bronchial asthma that is unresponsive to standard conventional therapy and may progress to respiratory failure with the need for mechanical ventilation. There are a lot of terms like acute severe asthma, brittle asthma near fatal asthma with differing definitions etc. but what matters are the findings of PCO<sub>2</sub> of more than 50mmHg and decreased level of consciousness takes us towards the diagnosis. For patients who first present for evaluation of new-onset wheezing, four different clinical entities like asthma, pneumonia, foreign-body aspiration, and congestive heart failure must be distinguished, because each of these diseases require a different diagnostic and therapeutic approach.

There are basically two types of status asthmaticus

- Slow-onset attacks (>6 hours of deterioration) are most common (~90%)

(inadequate treatment, low compliance, inappropriate control, coexisting psychological factors)

- Sudden-progression asthma attacks (<6 hours of deterioration) are less common (~10%).

(sudden exposure to a large amount of allergens )

Many statistics describe an ICU admission of 30 % to 40 % and a mortality of 1 -2 % with a non recognition of severity of obstruction by both the physician and the patient and failure of early institution of vigorous bronchodilation. Parenteral beta 2 agonists, steroids with supplemental oxygen and institution of differing ventilator modes form the essential core of management. Antibiotics, anticholinergics, magnesium sulfate, heliox, ketamine, inhalational agents, mucolytics are the additions in the armamentarium.

On the surgical side, considering an uncomplicated inguinal hernia, it's usually reducible with the presence of cough impulse. If these two are absent, the term irreducible is used.

Irreducibility with features of intestinal obstruction = obstructed hernia

Irreducibility with impairment of blood supply = strangulated hernia.

It's clear from the above that it may be even the omentum, which can become gangrenous and not necessarily intestine, to be called as strangulated hernia. To be precise, how far the impairment of blood supply has occurred: i.e. a total dead gut with toxemia and septic shock in one end or the omental gangrene with a stable hemodynamics on the other, form the two extremes of the clinical spectrum. The incidence of strangulated inguinal hernia varies between 0.29 and 2.9 %. The mortality rate also ranges between 2.6 to 9 %, but a delay of 12 h increased significantly intestinal resection rate. Hence it becomes the duty of the attending anesthesiologist to assess both the extent of respiratory failure and the level of sepsis to come to a reasonable conclusion about the anesthetic technique to be administered within a quick and reasonable period of time.

### **Preanesthetic evaluation:**

The term can be better called as **preoperative stabilization**.

Stabilization of bronchospasm forms the rule.

Salbutamol (albuterol) may given by metered dose inhaler (MDI) with a spacer (4-20 puffs/hour), by wet nebulization (WN) (5-10 mg q 15 min. prn), or intravenously (4 mg/kg load then 0.1-0.2 mg/kg/min. infusion. If the MDI acceptance and drug delivery seemed to be in acceptable range 2 puffs is enough in many cases but need to be repeated. For the rare severe asthmatic patient who does not tolerate bronchodilator aerosols (usually because of excessive coughing) or the spasm is severe enough to disallow nebulized drugs, parenteral therapy can be given using subcutaneous epinephrine (0.3 to 0.5 mg every 20 minutes for 3 doses) or subcutaneous terbutaline (0.25 mg every 20 minutes for 3 doses). The side effects include vasodilatation, skeletal muscle tremor, uterine muscle relaxation, hyperglycaemia, and hypokalaemia and rhythm disturbances which are more common after intravenous administration. Intravenous salbutamol as 250 µgm is the drug of choice but IV aminophylline 6

mg/ kg as a second drug has been used as an infusion but only in adults. the drug levosalbutamol has got minimal advantages in an acute setting. Long acting drugs like salmetrol or formetrol are not preferred here.

Low dose corticosteroids (80 mg/day of methylprednisolone or 400 mg/day of hydrocortisone) appear to be adequate in the initial management of adult patients, but as a routine 125 mg of solumedrol (methylprednisolone) followed by 8 hourly shots can be given. IV leukotriene receptor antagonist, montelukast, given to moderate to severe asthmatics demonstrated a significant improvement in pulmonary function within 10 min of administration but usefulness in an acute setting is still inconclusive. But anticholinergics have a role. The optimal dose of nebulized ipratropium bromide for acute asthma is not clearly known, but it is generally accepted that 500 µg will produce the peak bronchodilator response in acute asthma.

We should remember that intense bronchospasm can occur in the presence of normal or decreased PaCO<sub>2</sub> also. In our patient of sepsis the blood gas picture may complicate the respiratory changes with some metabolic components also. We can encounter a blood gas result with hypoxemia and a mildly elevated PaCO<sub>2</sub> which is incoherent with the level of acidosis and a decreased bicarbonate. An exact assessment of each component is a must in such cases.

***The decision as to who and when to intubate is more of an art than a science.*** Progressive exhaustion, respiratory arrest, decreased level of consciousness, persistent respiratory acidosis (pH<7.2) are clinical indications for endotracheal intubation and ventilation. it can be delivered non-invasively via a tight-fitting anaesthetic face mask or through a tracheal tube (in surgical cases) , the insertion of which may itself provoke further bronchoconstriction. Ventilating the lungs of a severe asthmatic will push inhaled gas through edematous and mucus blocked airways, exhalation will take a long time.

The ECG can show right atrial or ventricular hypertrophy, acute strain, right axis deviation, and right bundle branch block. Chest radiographs reveal flattened diaphragms if the lungs are hyperinflated, but are useful to evaluate for pulmonary congestion, oedema, or infiltrate. A FEV<sub>1</sub>/FVC ratio of less than 40 % and /or a PEF<sub>R</sub> of less 140 litres /minute indicate we are not that safe. A chronic hypoxemia may show a polycythemia and a total count may show leucocytosis wherever the infection arises. If there is a gut gangrene with ongoing blood loss, the

patient may be anemic. The fluid correction done based on the degree of intestinal obstruction - .mild: 1500 ml, moderate: 3000 ml, and severe with shock: 6–8 L. Even though in such cases an central line is obligatory, a CVP measurement to guide fluid status may be misleading due to abnormal intrathoracic pressures. An arterial line may guide inotropes in sick septic cases or else may help in repeated blood gas measurements. A transient hyperglycemia due to beta agonists and high dose steroids may be there but an HbA1C may reveal his diabetic status. An abnormal blood urea and with a normal creatinine may be seen and need to corrected with ringer's solution but a role of normal saline is peeping where vomiting supersedes the other symptoms. Normal coagulation parameters with platelet count in septic cases will clear our path towards regional techniques. Other than these investigations an urgent CT scan of the abdomen will clear our ideas about the presence and the level of gangrene inside. Any way we should always remember that a simple assessment of tongue, urine, pulse volume, respiratory rate, blood pressure, SaO2 can separate sick from the ordinary. Needless to say, the strict adherence to a preanesthetic protocol which also includes assessment of airway, spine and optimizing any other systemic illness if any gets no less a priority.

### **Anesthetic management:**

In a patient with stable hemodynamics and controlled status asthmaticus, a combined spinal epidural is an option. Bronchospasm can be provoked by laryngoscopy, tracheal intubation, airway suctioning, cold inspired gases, and tracheal extubation. Airway tone is increased by vagal stimulation caused by endoscopy, peritoneal, or visceral stretch. If airway manipulation is seemingly dangerous such plans can be executed with inotropic support for hemodynamic imbalances caused by neuraxial blockade. Adjuvants like fentanyl can also help. There is a belief that in cases of intestinal obstruction, a neuraxial blockade may cause an unblocked parasympathetic excess which may further constrict the gut to play spoilsport for the surgeon and the patient. A controlled general anesthesia with rapid sequence induction is the choice technique in sick cases. Eventhough propofol is used by many, ketamine with its intrinsic bronchodilatory properties may be ideal. But glycopyrolate and benzodiazepines are necessary adjuncts to ketamine. Thiopentone can increase bronchospasm in a few and hence avoided. The alpha-2 agonist dexmedetomidine has a favourable profile, including anxiolysis, sympatholysis, and drying of secretions without respiratory depression, but its role in severe asthma has not been

established. RSI with rocuronium is advocated by some to avoid the fasciculation and electrolyte disturbances of succinyl choline. As soon as intubation is over, we may land up in a situation of tight bag and an inability to push gases to the lung. Hence visualization of larynx before intubation is mandatory. Then we may need to push 100% oxygen with a bag in hand and agents. An intravenous lignocaine may be helpful to prevent this disaster. Patients can receive ketamine at a loading dose of 1 mg/kg (IV), followed by a continuous infusion of 1 mg/kg/hr for 2h. This technique is found to decrease mean airway pressures and PaCO<sub>2</sub> during the conduct of anesthesia. After confirmation of intubation, lignocaine 4 % can be poured through the tracheal tube to decrease airway hyper reactivity. Newer synthetic opioids are preferred than older morphine for the fear of histamine release and bronchospasm. Anaesthetic maintenance with a volatile agent such as isoflurane or sevoflurane confers protective bronchodilation. However, there is evidence that desflurane provokes bronchoconstriction in smokers. A higher agent concentration to maintain a higher FiO<sub>2</sub> is needed for many patients. ***It is to be remembered that inadequate anesthesia is a prompt promoter of intra operative bronchospasm.*** A preincisional TAP block can cover intraoperative analgesia and effect a better hemodynamics in the midst of beta agonists. All histamine releasing nondepolarizers like atracurium should be avoided. A proseal LMA insertion with continuous epidural may have an advantage of less airway invasion but increased intrathoracic pressure is a relative contraindication for insertion of supraglottic airway devices. In a study of seven children with status asthmaticus, sevoflurane inhalation corrected high levels of PCO<sub>2</sub> and provided clinical improvement in mechanically ventilated children with life-threatening asthma who fail to respond to conventional treatment. Hence it is to be noted that anesthetics themselves treat status asthmaticus and thus this property can be utilized for anesthetizing those patients for other surgeries.

In selecting a ventilatory mode, attention should be given to providing an adequately long expiratory time to avoid the build-up of intrinsic or auto-PEEP. This can be facilitated by using higher inspiratory flow rates or smaller tidal volumes than usual with less respiratory rates. 100 % oxygen with no PEEP can be initiated and can slowly come down on FiO<sub>2</sub>. Vigilant monitoring of dynamic hyperinflation by P. Plat. (should not be >40) and avoidance of barotrauma with pneumothorax is essential. Patients should be kept adequately hydrated as usual, but fluid overload, pulmonary congestion, and edema can precipitate bronchospasm. Many prefer to use volume controlled ventilation as peak pressures are already high.

Monitoring of pulse, blood pressure, central venous pressure, ECG, EtCO<sub>2</sub>, urine output is routine yet it is mandatory to monitor and maintain temperature, surgical field, blood loss and blood gases.

Bronchospasm is an important component to anaphylaxis induced by latex allergy. Non latex gloves can be preferred to surgeons. A very low critical levels of airflow may obscure breath sounds while an unilateral wheeze may imply endobronchial tube. Any intraoperative spasm should be treated by 8-10 puffs of MDI because of rain out of the tubes. Neostigmine increases bronchospasm risk because of its muscarinic and pro-secretory effects. These can be blunted by co-administration of atropine or glycopyrrolate, but the duration of action of neostigmine can outlast that of the vagolytic agent, especially in the presence of renal insufficiency. The suggamadex reversal is ideal if one wants to avoid the bronchospastic side effect of neostigmine. Adequate analgesia before reversal is mandatory. The concept of deep extubation is always risky during the arousal time because of its risk of aspiration.

### **Postoperative period:**

The keys to minimizing postoperative pulmonary complications are vigilance for bronchospasm and its causes; good pain control, be it either by the neuraxial route or patient controlled analgesia; bronchodilator therapy; incentive spirometry, deep breathing exercises, and early mobilization.

Some of the analgesic techniques are continuous epidural infusions, transverse abdominis plane blocks, parenteral narcotics and IV paracetamol. The NSAIDs should be used with caution because of their propensity to increase wheezing. Unnecessary suctioning should not be done to stimulate the airways. Any way postoperative bronchospasm and hypoxemia remain as risks where we should continue inhaled beta agonists and steroids. If necessary, the mechanical ventilation if instituted earlier may be continued till hemodynamics and blood gases come to an acceptable range.

### **Conclusion:**

The combined situation of status asthmaticus and strangulated hernia is a nightmare. There may not be time to stabilize the bronchospasm . Supplemental oxygen, Intravenous beta<sub>2</sub> agonists and

systemic steroids are the main stay with possible initiation of mechanical ventilation in selected cases. The impact of gut or omental gangrene on different systems is important for the management and outcome. Regional anesthesia in selected stable cases and controlled general anesthesia with an eye on prevention of worsening of bronchospasm remains the key of intraoperative care. Adequate postoperative analgesia with continued aggressive control of bronchospasm are necessary to achieve better outcomes.

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