The Indian Anaesthetists' Forum – (www.theiaforum.org) Online ISSN 0973-0311
July 2006(1)

WEANING FROM VENTILATOR IN A MORBIDLY OBESE PATIENT – ROLE OF TRACHEOSTOMY

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Introduction:

Morbid obesity is a problem not only for the person himself but also to the whole treating medical team. The problem associated with bariatric surgery for these morbid persons are multifactorial even if it is an elective routine procedure with other wise healthy lungs. Anaesthetic management becomes more challenging[1] when this type of patient comes for emergency surgery with already compromised lungs like lower lobes collapse with consolidation having poor respiratory reserve and low arterial oxygen saturation (SPO_2).Subsequent postoperative ventilatory management and weaning becomes very difficult. Here we present such a case which could be weaned from ventilator easily after tracheostomy following a prolonged trial and error with intact trachea. This type of case is also very rare in the literature.

Case History:

A 24 years old morbidly obese patient, weighing 140 kg with BMI 42%, was posted for laparoscopic gastric bypass surgery under general anaesthesia for weight reduction. He was nonalcoholic, nonsmoker and had no other systemic/endocrine disorder or sleep apnoea syndrome. He has the family history of obesity as one of his sisters had also under gone the same procedure six months back.

During his preoperative evaluation his general systemic conditions were unremarkable. His neck was relatively short because of fat disposition over the submandibular and chest region. His neck movement and mouth opening was normal. His preoperative investigations were; Hb-16.4 gm%, TLC-8000/dl, fasting blood sugar-

96 mg%, serum Na/K-138/3.9 mmol/L, blood urea & serum creatinine level, chest X-ray (Fig. 1) and EKG were within normal limits.

He was trained with incentive spirometry with a Triflow® and intermittent deep breathing exercises. On the day of surgery he was premedicated with midazolam; 15 mg orally one hour prior to induction of anaesthesia and low molecular weight heparin (Clexane®) 40 mg was injected subcutaneously as prophylaxis against deep vein thrombosis.

On arrival into the operation theatre venous access was performed, all monitoring devices were attached (EKG, SPO_2, and NIBP). After obtaining the basal parameters, preoxygenation was carried out for three minutes with the patients in supine head-up position. Anaesthesia was induced with diprivan 300 mg and intubated with the help of 150 mg suxamethonium. After confirming the tube position and equality of air entry into both lungs, cisatracurium (Nimbex®) 14 mg bolus was injected and an infusion of 10 mg/hour was initiated for continuous muscle relaxation and intermittent positive pressure ventilation was carried out to maintain normocarbia with Ohmeda® ventilator attached to anaesthesia workstation. Anaesthesia was maintained with 50% N_2O in O_2 and sevoflurane between 1-3%. After cannulating right radial artery, remifentanil (Ultiva®) 100 μg bolus was administered followed by 1mg/hour infusion was initiated but adjusted according to the need of the patient for intraoperative analgesia. Intraoperative monitoring consisted of continuous EKG, HR, SPO2, IBP, $ETCO_2$, FiO_2, PAW, temperature, urine output and blood loss.

Procedure: Laparoscopically a Roux-en- Y gastric bypass procedure (upper small pouch gastrojejunostomy with jejunojejunostomy and jejunotomy) as performed over three and half hours without any untoward events. Total blood loss was about 200 ml.

At the end of the procedure patient was extubated on the table after reversing the residual neuromuscular blockade. He was fully conscious and his respiratory parameters were with in normal limits. For subsequent postoperative management he was shifted to ICU for continuous monitoring (EKG, SPO2, HR, NIBP, RR, urine output and blood loss through abdominal drains) and effective postoperative analgesic therapy. Initially he was administered 75 mg diclofenac–Na plus 100 mg pethidine intramuscularly and then infusion at the rate between 15-25 mg/hour was adjusted to get maximum pain relief without suppressing respiration. He was receiving eight litres oxygen by mask in semi-sitting position comfortably. IV fluids (ringer lactate and 5% dextrose saline) were infused 150-200 ml/hour. His blood gas

parameters were maintained within normal limits. He was ambulated after six hours of ICU stay.

Thirty six hours after the 1st procedure he developed moderate abdominal distension and became tachypnoeic with respiratory rate between 30-36/minute and SPO_2 between 85-92% which was maintained before between 95-100%. Air entry on both the bases of lungs was diminished but more on the left side. At that time a contrast CT of abdomen showed features of anastomotic obstruction with huge distension of the lower big segment of the stomach plus collapse consolidation of the lower lobes of both the lungs; more on the left side. But X-ray chest showed minimal changes of both the lungs. ABG result with 10 L O_2 showed PH-7.34, PaO_2 - 62 mmHg, $PaCO_2$ - 32 mmHg and base deficit 4.04. He was haemodynamically stable all along and urine output was normal. At this point exploratory laparotomy was planned to correct the abnormalities in the anastomotic areas.

After preoxygenation, patient was induced with diprivan 250 mg and intubated with suxamethonium 150 mg. Subsequently similar anaesthesia technique was followed as for the 1st time but no nitrous oxide was provided to maintain a stable SPO_2 between 95-100%. On exploration of the abdomen another jejunojejunostomy was performed to facilitate easy drainage of the content of the lower big gastric pouch as it was found that the initial upper gastrojejunostomy anastomosis was in wrong direction. Lower pouch gastrostomy was performed with a wide bore Folley's catheter to fecilitate the drainage of the already collected gastrobiliary secretions. Immediately two litres of bilious secretion came out with force. There was no visible intestinal peristalsis. Abdomen was closed completely keeping the previous two drains. The procedure lasted for three hours. In view of the already bad chest condition, abdominal distension and upper abdominal big incision with morbid obesity, elective ventilation was planned to allow his chest and abdominal condition to improve. At this time he was requiring 100% O_2 to maintain his SPO_2 around 98% but gradually it was reduced to 80% with the guidance of ABG reports. X-ray chest revealed bilateral basal infiltrates more so on the left side with upward displacement of left dome of the diaphragm (Fig. 2). Two broad spectrum antibiotics plus metronidazole therapy was initiated in the perioperative period and subsequently antibiotics were chosen according to the culture sensitivity reports of the endotracheal aspirates plus wound swabs. Sedation with midazolam 10mg/hour and analgesia with pethidine 15 mg/hour plus nimbex 15 mg/hour infusions were continued to carry out effective ventilation with 5-15 cm H_2O PEEP. Total parenteral nutrition (2000 KCal/day) was provided from 2nd postoperative day onwards to maintain his total nutritional

requirements. Blood and blood products were transfused time to time to maintain optimum Hb% and plasma protein levels.

After eight days of continuous ventilation with gradually reducing FiO_2 and marginal changes in chest X-ray, patient was maintaining well with 50% FiO_2 on CPAP mode with SPO_2 between 94-98%. At this time a trial of extubation was carried out to see how far he can manage of his own. Unfortunately he could maintain his spontaneous respiration, SPO_2 and ABG parameters only for eleven hours. Then he became exhausted. Immediately he was reintubated after sedating with diprivan 200 mg and paralysing with suxamethonium 100 mg. Then all his sedative, analgesic and nimbex infusions were resumed for effective ventilation which was continued for another seven days. During this period twice fibreoptic bronchoscopic lavage and suction were performed to clear the lower lobes of both the lungs and we were not permitted by the relatives to do the tracheostomy. After seven days, his intestinal peristalsis returned, we started to wean him off the ventilator after stopping all his sedation and relaxant. Two days after 2nd bronchoscopy, planned extubation was carried out with an available hired BiPAP machine ready to use. Immediately after extubation he was put into the BiPAP machine (peak 15 & plateau 10 cm H_2O pressure) with 45% oxygen. Patient could manage his spontaneous respiration with normal SPO_2 and ABG parameters for thirty six hours. Then he became exhausted with falling SPO_2 to 80%.

Again he was reintubated without any sedation or relaxant and connected to ventilator with 100% FiO_2. Five minutes after intubation when his SPO_2 was 100%, he developed ventricular tachycardia (with HR more than 180/min.) which was immediately reverted back to normal sinus rhythm with single DC shock of 300 joules. Subsequently he was stabilized by ventilation with gradually reducing FiO_2 along with sedative, relaxant and amiodarone therapy (300 mg IV slow bolus and 300 mg infusion over 24 hours). When the patient was maintaining his ABG with 50% O_2, relatives were convinced to allow us for a tracheostomy which was performed on the 6th day of 2nd reintubation with the X-ray chest almost same as before (Fig. 3). From the next day of tracheostomy step wise weaning was started after stopping both sedation and relaxant. Gradually his chest X-ray became better & better by proper suctioning and effective coughing, he could be left to minimal O_2 therapy through modified 'T' - piece on 4th day of tracheostomy. On 35th postoperative and 8th day after tracheostomy he was shifted to surgical ward breathing room air with SPO_2 between 94-98% and almost normal X-ray chest (Fig. 4). After another 10 days but before final discharge form the hospital his tracheostomy was closed with out any problem to his respiration.

Discussion:

Together with pulmonary emboli, anastomotic leaks and respiratory failure account for 80% of all deaths (1%) in the first 30 days following bariatric surgery[2]. This case had respiratory failure, anastomotic block with paralytic ileus and difficult weaning but luckily no mortality. Two times of failure to wean from ventilator was due to persistent atelectesis in the base of the lungs because of the distended abdomen and poor cough reflex of the patient. Routine endotracheal suctioning with chest physiotherapy and change of position could not clear the atelectetic areas. It was possible after bronchoscopic suction for few hours only. Prone position ventilation[3] which helps to drain out secretion from the bases was not practically possible for his weight and abdominal condition. Continued antimicrobial therapy (both antibiotic and antifungal), application of PEEP and intermittent sigh ventilation too could not help in any way. Even continuous BiPAP ventilation could not assist him to avoid further intubation and ventilation as he became exhausted. An early tracheostomy[4-8] which would have assisted to wean smoothly after 1st reintubation could not be performed as relatives were reluctant to give the consent for it. At last when tracheostomy could be performed, his chest condition started improving very fast. Tracheostomy helped to make very effective suctioninig of the endobroncheal secretion which was brought up by patient's effective cough. Over and above reduction of the dead space, tracheostomy assisted the patient to breath easily[4] and could be weaned from ventilator quickly.

Tracheostomy is the most frequently performed procedure in critically ill patients. It is done in around 24% of patients in medical ICUs and commonest indication is prolonged mechanical ventilation[9]. Tracheostomy has many advantages over endotracheal tube; It lowers airway resistance, reduces dead space, less movement of the tube within the trachea, greater patient comfort and effective suction. Plus it helps to avoid the laryngeal complications of prolonged intubation like hoarsness, vocal cord immobility, and laryngeal stenosis resulting in impaired speech. But the optimal timing of tracheostomy, its impact on weaning from mechanical ventilation and outcomes in critically ill patients remain unresolved. Guentner K et al[9] have recommended tracheostomy to be performed after seven days of mechanical ventilation where as Hsu CL et al[10] in their retrospective study have concluded that tracheostomy after 21 days of intubation is associated with a higher rate of failure to wean from mechanical ventilation, longer ICU stay and higher mortality there by indirectly recommends for an earlier tracheostomy. They have encountered bleeding, air leak, pneumothorax, subcutaneous emphysema, cardiopulmonary arrest, dislodgement of the tube, tube obstruction, post-tracheostomy

pneumonia, granuloma formation, tracheal stenosis, tracheo-oesophageal fistula and tracheomalacia as the complications of tracheostomy and its incidence varies between 6-51% in adults. There is no end to the debate on tracheostomy to be preformed even over terminally ill patients for their comfortable death during withdrawing or withholding their life support as discussed by Liolios A[11] over the subject.

Well done prospective clinical studies on the effects of tracheostomy on weaning, as opposed to laboratory and short-term physiologic studies, are few. A recent clinical trial on early versus delayed tracheostomy found dramatic reductions in ventilator and ICU days, the incidence of pneumonia, and overall mortality[12], there by supporting for early tracheostomy. Several factors make carrying out clinical research in this area problematic; however it remains uncertain whether patients with acute respiratory failure are benefited by early tracheostomy as opposed to delayed tracheostomy or prolonged endotracheal intubation. The tendency of clinicians to manage patients with endotracheal tubes differ from those with tracheostomies and to discontinue ventilatory support more readily in the latter group, further compounds the uncertainty about the best application of tracheostomy as an aid to weaning. Tracheostomy probably does aid in liberating some patients from ventilatory support but this may be as much from its effect on clinician behaviour as from any physiologic impact[13].

What ever may be the controversy on the issue of tracheostomy and its outcome, this case provided us ample experience for management for such case in future. As this case was 1st such complication in this type of bariatric surgery cases, no one could exert upon the family members to modify their decision to go for an early tracheostomy[4,5] as recommended by many authors in different clinical situations[6-10,12].

Hence from the experience out of this patient it may be recommended that early tracheostomy, in a case of morbid obesity with respiratory complications, may help to wean from mechanical ventilation quickly. This temporary tracheostomy can be closed gradually over a short period of time without complication when chest condition normalizes.

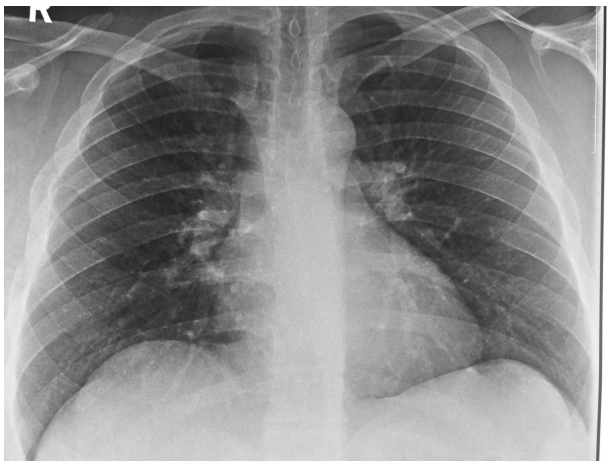

Fig. 1

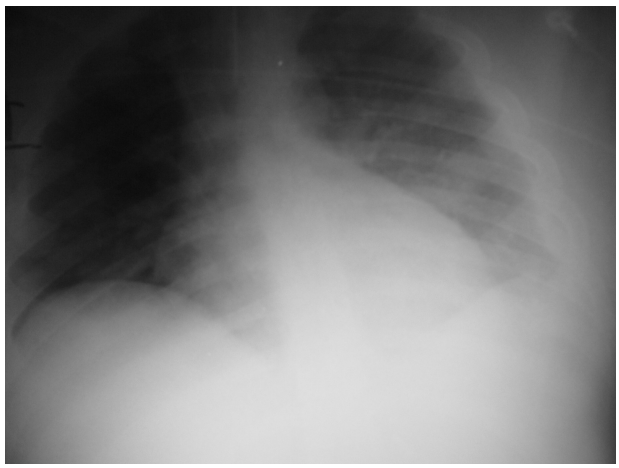

Fig. 2

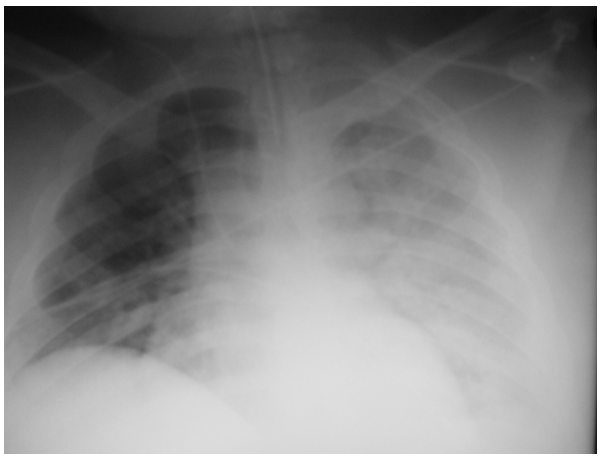

Fig. 3

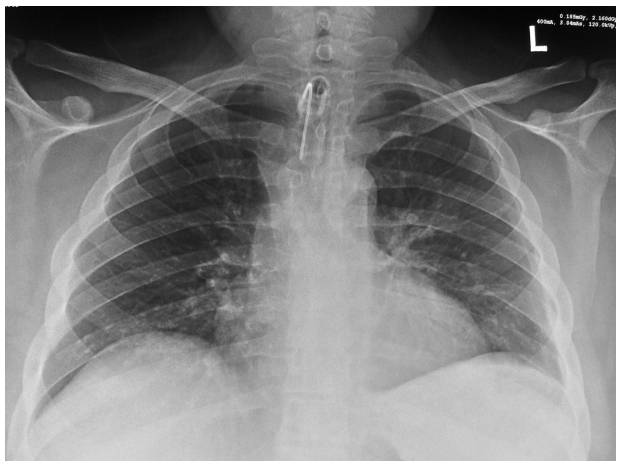

Fig. 4

References:

1. Rao SM. Morbid Obesity – Anaesthetic Management. The Indian Anaesthetists' Forum (www.theiaforum.org); 2003:April.
2. Viriz A,Murr MM. Caring for Patients After Bariatric Surgery. American Family Physician.2006;vol. 73 (8):April 15.
3. Shelly MP, Nightingale P. ABC of intensive care; Respiratory support. BMJ; 1999:318:1674-1677.
4. Diehl JL, Atrous El, Touchard SD et al. Changes in the work of breathing induced by tracheotomy in ventilator-dependent patients. Am J Respir Crit Care Med;1999:159:383-388.
5. Rumbak MJ, Newton M, Truncale T, et al. A prospective, randomized, study comparing early percutaneous dilational tracheotomy to prolonged translaryngeal intubation (delayed tracheotomy) in critically ill medical patients. Crit Care Med; 2004:32:1689-1694.

6. Chintamoni,Khanna J,Singh JP,Kulshreshtha P et al. Early tracheostomy in closed head injuries:experience at a tertiary center in a developing country – a prospective study. BMC Emergency Medicine;2005: 5:8.
7. Rodriguez JL, Steinberg SM, Luchetti FA, Gibbons KJ, Taheri PA, Flint LM: Early tracheostomy for primary airway management in the surgical critical care setting.Surgery; 1990:108:655-659.
8. Arabi Y, Hddad S, Shirawi N, Al Shimemeri A: Early tracheostomy in intensive care trauma patients improves resource utilization: a cohort study and literature review. Critical Care;2004:8:R347-R352.
9. Guentner K,Hoffman LA,Happ MB et al.Prferences for mechanical ventilation among survivors of prolonged mechanical ventilation and tracheostomy.Am J Crit Care;2006:15(1):65-77.
10. Hsu CL,Chen KY,Chang CH et al. Timing of tracheostomy as a determinant of weaning success in critically ill patients: A retrospective study.Critical Care;2005:9(1):R46-R52.
11. Liolios A. Extubation vs tracheostomy for withdrwal of mechanical ventilation: which is the better approach? Medscape Critical Care; 2003, December.
12. Rumbak MJ, Newton M, Truncale T et al.. A prospective, randomized, study comparing early percutaneous dilational tracheotomy to prolonged translaryngeal intubation (delayed tracheotomy) in critically ill medical patients. Crit Care Med 2004;32(8):1689–1694.
13. Pierson DJ. Tracheostomy and Weaning. Respiratory Care.;2005:50(4):526-533.