

Injection of Methylene Blue in the Lungs during Laparoscopic Cholecystectomy: A Case Report

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Abstract

It is common to use in a surgical setting a Naso Gastric (NG) tube to empty the stomach, monitor the occurrence of bowel occlusion and detect the presence of a gastric leak after major abdominal surgery through the injection of methylene blue.

A 68-year-old male patient presented to the operating room for scheduled laparoscopic cholecystectomy. After tracheal intubation and commencement of surgery, an 18 Fr. NG tube was inserted blindly through the nostril with no means of assessing its position to assess the integrity of the stomach. A solution of methylene blue was prepared and 240 ml were injected in the NG tube. Upon applying negative pressure suction on the NG, a noticeable change in airway pressure was noted and investigation through the use of fiber optic vision revealed the presence of bluish liquid in the bronchi. The NG tube was then re-inserted, the surgeon made the final confirmation of its proper placement within the stomach and the surgery continued uneventfully. Postoperative chest x-ray was suggestive of chemical pneumonitis and emphysema. Patient was first admitted to the intensive care unit for close monitoring, to be then transferred to the ward and later discharged on post-operative day three. With little information concerning such accidents, further studies concerning the effect of MB on the lungs are highly needed. We report this case due to its rare incidence, favorable outcome and potential in illustrating the importance of proper verification of NG tube placement.

Keywords: Laparoscopic cholecystectomy; Methylene blue; Nasogastric tube; Chemical pneumonitis; Emphysema

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Citation: Kafrouni H (2021) Injection of Methylene Blue in the Lungs during Laparoscopic Cholecystectomy: A Case Report. J Health Commun Vol.6 No.S5:31.

Received: October 18, 2021; **Accepted:** November 01, 2021; **Published:** November 08, 2021

Introduction

Intraoperative Methylene Blue (MB) injection is commonly used in surgical settings as a safe and effective technique to detect gastric leak during laparoscopic abdominal surgery [1]. A Naso Gastric (NG) tube is regularly emplaced to empty the stomach and to monitor the occurrence of bowel occlusion after major abdominal surgery. However, the incidence of misplacement of NG tubes into the airways ranges between 0.3% and 15% and is associated with significant morbidity and mortality [2-4].

Case Presentation

A 68-year-old male patient known to have diabetes mellitus II and a history of gallstones presented to the operating room for scheduled laparoscopic cholecystectomy. The patient had

reported right upper quadrant pain, and the physical examination was not conclusive (Murphy and Mc Burney signs negative). A CT scan with IV contrast of the abdomen was performed and revealed a distended gallbladder with thickened walls and multiple gallstones the largest 18 mm × 15 mm, fluid around the gallbladder and fat streaking, and a 6 mm calculus in the common bile duct but no distention of the duct. The findings were compatible with acute calculus cholecystitis. An ERCP was done, and the patient was scheduled for surgery.

The patient was studied preoperatively with complete investigations, a multidisciplinary workup including specialist counseling (gastroenterology, anesthesiology, cardiology, and endocrinology) and complete performance status evaluation. On physical examination, he had clear auscultation of the lungs, good bilateral air entry with no adventitious sounds. Preoperative

chest radiography depicted infiltrates in the lingual, otherwise clear and a cardiac index within normal range. Patient was well informed about the surgical procedure, including all possible complications.

On the day of surgery, the patient presented fasting for more than 6 hours. General anesthesia was administered; endotracheal tube size 8.5 was inserted under vision with its cuff inflated (approximately 7 cc of air). Chest auscultation was done and found to be bilateral, symmetrical and clear. The tube was then secured in place and the eyes protected. The stomach was decompressed using a suction catheter 18 French and kept emplaced. The laparoscopic intervention started and revealed extensive adhesions around the gallbladder requiring excessive dissection. After removing the gallbladder, the surgeon requested injecting MB through an NG tube to verify the integrity of the stomach. The suction catheter was removed and NG tube 18 French was inserted through the nostril. No difficulty or obstruction was encountered. Since the surgery was in progress and sterility established, the position of the NG tube could not be confirmed by auscultation, suctioning was done and revealed no liquid. A solution of MB (1% 100 mg 10 ml vial diluted in 1000 ml sterile water) was prepared and 240 ml of the solution was injected by increments of 60 ml in the NG tube. The surgeon declined distention of the stomach. Upon applying negative pressure suction on the NG tube, no fluid was collected but a decrease in airway pressure was noted. Therefore suspicion was raised about the position of the NG tube being in the lungs instead of the stomach. The NG tube was removed, and fiber optic vision revealed bluish liquid in the bronchi confirming the suspicions. The patient's oxygen saturation did not decrease from baseline and vitals remained stable.

Anterior auscultation of the chest was clear and negative for adventitious sounds. Hydrocortisone 100 mg intravenous was administered as prophylaxis. An orogastric tube 18 French was then inserted and the injection of air distended the stomach as seen by the surgeon confirming proper positioning of the tube. The surgery proceeded uneventfully. The patient was then awakened and extubated after spontaneous breathing with good volumes and 100% saturation with clear lungs on auscultation. The patient's vitals remained stable as he was transferred to the Post Anesthesia Care Unit (PACU). In the PACU the patient was put on facemask 5 L oxygen to increase his saturation from 90% to 99%. Immediate post-operative chest radiographs (Chest X-Ray number 1 and 2) were done in the PACU revealing congested lungs infiltrates in the right base and soft tissue emphysema on the right at the level of the lower chest and abdomen. The patient was transferred to the intensive care unit for monitoring and was started on supportive treatment for chemical pneumonitis. Another chest X-ray (Chest X-Ray number 3) done later that same day showed a decrease in the right basal infiltrates and soft tissue emphysema based on which the patient was taken off oxygen supplementation. The next day, the chest X-ray (Chest X-Ray number 4) demonstrated further decrease in infiltrates. The patient's laboratory work-up was improving with a significant

decrease in white blood cell count and inflammatory markers seen preoperatively. Therefore, the patient was transferred to the regular ward where he resided for two more days. The consequent chest radiographs (Chest X-Ray number 5 and 6) showed no active lung infiltrates and the patient was discharged home on post-operative day three.

Results and Discussion

The different complications and risk factors that are associated with blind tube insertion and the verification methods of correct placement have been well examined in multiple studies. Patients are exposed to potentially serious morbidity and mortality from blindly inserted NG tubes. It has been associated with numerous adverse outcomes such as aspiration pneumonia, nasal mucosal bleeding, intracranial placement, esophageal and other enteric perforation, hypertension, tachycardia, arrhythmia, bronchial placement, pneumothorax, hydrothorax, empyema, and vascular penetration [5-7]. Risk factors associated with malposition include blind insertion, the presence of endotracheal tubes, altered sensorium, and previous tube misplacements [8]. The National Patient Safety Agency (NPSA) issued guidelines for NG tube insertion with a list of recommended tests to confirm correct gastric position [9]. It included measuring the acidity/alkalinity of aspirate (stomach contents) using pH indicator strips in the range 0 to 6 and radiography, emphasizing the inaccuracy of other tests still in use such as the "whoosh" test, and monitoring for bubbling at the proximal end of the tube because the stomach also contains air and could falsely indicate respiratory placement [9].

Tackling the incidence of injecting profuse amounts of MB solution into the lungs, no literature was found but rather some studies on injecting minute amounts of MB for localization of pulmonary nodules, staining technique for identifying intersegmental planes, and retrograde instillation during bronchoscopy for diagnoses of bronchopleural fistula [10-12]. Only one similar case report with the injection of 150 ml of MB stain into the lungs during gastric bypass to check for the absence of digestive fistula was found [12]. Patient management and outcome was briefly discussed, with the use of ultrasound for diagnosis of NG tube misplacement into the trachea [12-15].

In the case discussed, initially, no means of verifications other than suctioning was applicable because sterility was already established. MB injection through an NG tube is not a common procedure in classical cholecystectomy, so the tube was not emplaced ahead of time. After the occurrence of the accident, the patient was admitted to the ICU for further observation and supportive treatment. It is important to note that no standard protocol of treatment is present for this specific event, and the patient was managed for chemical pneumonitis. The progression was under close surveillance; follow up chest X-Ray revealed amelioration. The patient did not require any other interventions (**Figure 1**).

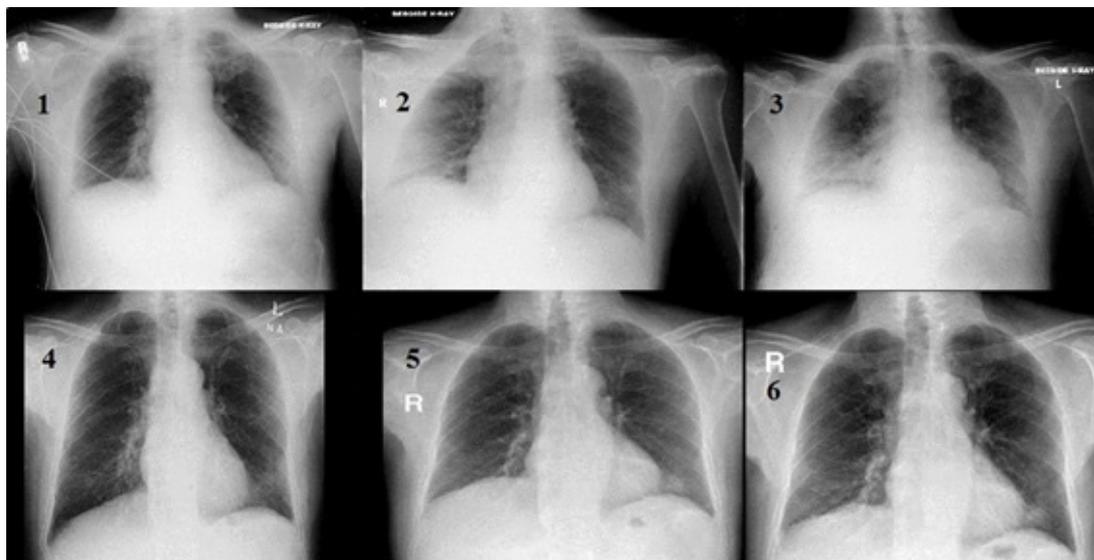


Figure 1 Serial Chest X-Rays done to monitor the evolution of the chemical pneumonitis after the injection of methylene blue, 1-PACU post-operative Chest X-ray, 2-PACU post-operative Chest X-ray, 3-Chest X-ray done in Intensive Care Unit, 4-Chest X-ray in ICU off oxygen, 5-Chest X-ray done on the regular ward, 6-Chest X-ray done on the regular ward.

Conclusion

Methylene Blue staining may be used to identify tissues in the lungs but the frank injection of copious quantities of the solution in the lungs is not standard practice. The consequences of such an act were not extensively reported in the literature so far. In this case, the accidental injection of a rather large volume of MB solution into the lungs did not lead to deterioration in the ventilatory status of the patient. Nonetheless radiologic signs lead to a high suspicion of chemical pneumonitis that was successfully monitored and managed in the ICU within few days with no sequelae. As the intraoperative use of MB has increased, so has the risk of its accidental use. Further investigations on the effect of MB on lung tissue with appropriate protocol of management should be done. We report this case due to its rare incidence, favorable outcome and potential in illustrating the importance of proper verification of NG tube placement.

Consent

Written consent was obtained from the patient for this case report.

Conflict of Interest

The authors declare that there are no conflicts of interest.

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