How I Do It

Determining Between Chyle Leak and Anastomotic Leak After Esophageal Reconstruction: The Utility of Methylene Blue Dye

Shivam Kapila, BSc, MBBS; Warren M. Rozen, MBBS, PhD; Tom Huang, MBBS; Terry Wu, MBBS, FRACS; Sian Fairbank, MBBS, FRACS

Objectives/Hypothesis: Two common complications of esophagectomy and immediate reconstruction comprise thoracic duct injury leading to chyle leak and anastomotic leakage. These can delay optimized nutrition, speech, and swallowing rehabilitation, and thus are important to identify and treat accordingly. When either chyle leak or anastomotic leak are clinically suspected, differentiation between the two can be very difficult clinically. As both complications may result in an increase in drain output once oral intake has occurred, an effective, quick, and accurate tool is required to determine whether this increase in drain output is related to an anastomotic leak or with an increase activity in chyle production.

Study Design: Retrospective descriptive study.

Methods: Description of the use of oral methylene blue dye as a safe, simple, and quick clinical bedside test.

Results: When ingested orally, an anastomotic leak will lead to blue dye staining the neck drain output immediately (within seconds to minutes). A chyle leak may also result in blue staining of the drain output; however, this is not an immediate phenomenon, and rather, based on the bioavailability of methylene blue this would take a minimum of 1 hour, and more likely up to 4 hours, as the dye is absorbed into mesenteric lymphatics and travels via the thoracic duct.

Conclusions: With no documented contraindications or side effects from its oral use (in the absence of hypersensitivity reactions), methylene blue is an inexpensive and freely available test in the postoperative setting of esophageal reconstruction.

Key Words: Free flap, reconstruction, head and neck, buried, complications.

Level of Evidence: 5


INTRODUCTION

When Billroth first described the surgical approach for treatment of carcinoma of the hypopharynx and cervical esophagus in 1873 and Trotter described the option of skin flap reconstruction in 1912, the complication rates suggested that operative resection would only be considered as a palliative procedure.¹ Significant improvements in technique and application meant that this clinical problem can be approached with a curative intent. Despite the increasing operative safety and the common use of reconstructive techniques for esophageal resection, complications still occur.

Thoracic duct injury leading to chyle leak is a significant and not uncommon complication following surgery of the neck, and although rates of 5% to 10% are frequently reported, rates reaching as high as 38% have been described.² Anastomotic leakage, another complication of esophageal reconstruction, has rates reaching 32%.³ These rates increase in patients with recurrent disease, particularly in the setting of prior radiotherapy. Complications such as these delay optimized nutrition, speech and swallowing rehabilitation, and thus are important to identify and treat accordingly.

When either chyle leak or anastomotic leak are clinically suspected, differentiation between the two can be very difficult clinically, and diagnosis is essential in order to either start oral food intake or to surgically revise the reconstructive flap. Clinical tests include assessment of fever and white cell count, although these are nonspecific. Similarly, simple observation of fluid output after fatty challenge is an option; however, the presence and volume of a white fluid are both variable.
A more objective option is to perform biochemical analysis of neck drain output for triglyceride and cholesterol concentrations to determine if a chyle leak has occurred. However, these tests take time to analyze and are associated with false negatives. Anastomotic leaks can be investigated through diagnostic imaging; however, the many advanced, expensive, and intrusive radiological investigative techniques for determining an anastomotic leak are still limited by anatomical and technical problems, and argument still remains regarding the prognostic value of radiographic swallowing studies even prior to oral intake due to low sensitivity. As both complications may result in an increase in drain output once oral intake has occurred, an effective, quick and accurate tool is required to determine whether this increase in drain output is related to an anastomotic leak or with an increase activity in chyle production.

TECHNIQUE

We thus describe the use of oral methylene blue dye in this role. The methylene blue dye test is a safe, simple, and quick clinical bedside test. We use 5 mL of methylene blue dye diluted in 20 to 50 mL of plain water. When ingested orally, an anastomotic leak will lead to blue dye staining the neck drain output immediately (within seconds to minutes). A chyle leak may also result in blue staining of the drain output; however, this is not an immediate phenomenon, and rather, based on the bioavailability of methylene blue this would take a minimum of 1 hour and more likely up to 4 hours to occur, as the dye is absorbed into mesenteric lymphatics and travels via the thoracic duct.

As such, within 15 minutes of observation, an anastomotic leak can be excluded, and oral intake can be initiated. Several hours later, a chyle leak can also be included or excluded as a diagnosis. Once this diagnosis is made, a treatment plan can be implemented ensuring earlier nutrition, swallowing and speaking rehabilitation, and reduced morbidity for the patient.

CONCLUSION

With no documented contraindications or side effects from the oral use of methylene blue dye (in the absence of hypersensitivity reactions), the methylene blue dye test is an inexpensive and freely available test in the postoperative setting of esophageal reconstruction.

BIBLIOGRAPHY