Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
Improved Safety of Endoscopic Vessel Harvesting During the COVID-19 Pandemic

Syed M. Ali Hassan, BSc, Camila Mayorga Palacios, BSc, Tarrah Ethier, BSc, and Gianluigi Bisleri, MD
Division of Cardiac Surgery, Queen’s University, Kingston, Ontario, Canada

The COVID-19 pandemic has necessitated that operating room procedures be modified to ensure the safety of staff and patients. Specifically, procedures that have the potential to create aerosolization must be reassessed, given the risk of viral transmission via aerosolization. We present the use of a nonsealed endoscopic vessel harvesting approach during coronary surgery that does not necessitate the use of CO2 insufflation and utilizes suction through an ultra low particulate filter, thus mitigating the risk of possible viral transmission via aerosolization or surgical smoke production. This approach is technically feasible and can minimize the risk of viral transmission during endoscopic vessel harvesting.

(Ann Thorac Surg 2020;110:e449-50) © 2020 by The Society of Thoracic Surgeons

The COVID-19 pandemic has necessitated that operating room procedures be modified to ensure the safety of staff and patients. Specifically, procedures that have the potential to create aerosolization must be reassessed, given the risk of viral transmission during such procedures.1–3 The sensitivity of reverse transcriptase polymerase chain reaction for COVID-19 testing is as high as 90%; however, that means that at least 10% of patients have false negative results.4 Therefore, even when a patient has tested negative, appropriate precautions need to be maintained, especially in an operating room environment where certain procedures are at risk of creating aerosol. The risk of viral spread through aerosolized gas during endoscopic surgery is a theoretical one, although previous studies have shown that viruses have the potential to be carried in both surgical smoke and aerosolized gas.5,6 While its transmission via this method is not fully understood, COVID-19 presents a novel risk for which precautions must be taken if possible and where feasible. To date, the most adopted method for EVH has been based on a sealed approach that utilizes an active insufflation of CO2, thereby potentially exposing operators to an increase risk of infection. We present the use of a nonsealed endoscopic vessel harvesting (EVH) approach during coronary artery bypass surgery that does not necessitate the use of CO2 insufflation and thus mitigates the risk of possible viral aerosolization.

Technique
Since March 18, 2020, 28 consecutive patients underwent coronary artery bypass grafting with a nonsealed endoscopic approach for conduit harvesting at the Kingston Health Sciences Centre. The mean age of these patients was 70 ± 7 years, with 7 (25%) women, 11 (39%) with diabetes, 5 (17.8%) obese, 13 (46%) with hypertension, and 11 (39%) with dyslipidemia. Of these, 23 patients underwent endoscopic harvesting of the great saphenous vein and 5 underwent endoscopic radial artery harvesting. These patients had been admitted to Kingston Health Sciences Centre after the COVID-19 emergency had been declared in Ontario. Assuming universal precautions, especially given the risks of asymptomatic viral transmission, it was decided that a nonsealed approach for EVH would be utilized to minimize the risks of aerosolization that could potentially occur with CO2 insufflation.

This technique utilizes an endoscopic retractor (Bisleri Model, Karl Storz, Tuttlingen, Germany) to spread the tissue and create a tunnel within which the operator can then harvest the conduit. During this process, no CO2 insufflation is performed. Optionally, a minimum amount of CO2 can be utilized for visual flushing; however, given the proposed risks of viral aerosolization, CO2 was not used at all in this series of patients. After patient...
positioning with legs in a “frog-like” position the great saphenous veins on both legs are echo mapped with the patient in Trendelenburg and a tourniquet tied around the upper thigh. For the radial artery, the arm is hyper-extended with a rolled towel under the wrist and an incision is made 1-2 cm above the wrist crease and no mapping is required. For saphenous vein harvesting a 2-3 cm longitudinal incision is made above the knee, adequate exposure is created under direct vision, and a vessel loop is utilized for improved control of the vein. After 3-4 cm of the vein has been mobilized, the endoscopic retractor is inserted to create a tunnel. The retractor is used by the operator to spread the tissue and visualize the target conduit and the vessel loop is used to provide traction. An impedance-controlled, bipolar radiofrequency vessel sealing system (LigaSure Maryland, Medtronic, Minneapolis, MN) is then used to dissect the side branches and mobilize the vein as a pedicled graft (Video 1, Figure 1). The LigaSure device creates minimal smoke that is removed using a suction device that is attached to the retractor and connected to an ultra low particulate air filter (CONMED, NY) which can remove particles as small as 0.1-0.2 micron in size. The filter setting is kept at low to reduce obstruction of the camera view due to excessive suction of the tissue towards it. This is sufficient to remove the small amount of smoke that might be generated. The vein is harvested to a length of 20-25 cm up to the thigh and a curved pigtail vessel dissector (Hook Dissector, Karl Storz) is used to assess complete mobilization of the conduit. The vein is then proximally incised and retrieved. A similar harvesting technique is utilized for the radial artery while maintaining a dissection plane between the brachioradialis muscle and the flexor carpi radialis and taking care not to damage the radial nerve (Video 2). Both the radial artery and vein harvesting are performed as a no-touch technique. All patients had an uneventful hospital stay and were discharged after a postoperative stay of 5.4 ± 2 days.

Comment

We present the use of a nonsealed endoscopic vessel harvesting approach during coronary artery bypass surgery that does not necessitate the use of CO2 insufflation and thus mitigates the risk of possible viral aerosolization. It is important to note that, given the risk of asymptomatic transmission and the 10% chance of false negatives, it is imperative that universal precautions be taken for all cardiac surgery patients. Although the risks of COVID-19 transmission via smoke production and aerosolization due to CO2 insufflation have yet to be fully elucidated, previous studies have shown the presence of hepatitis B virus in surgical smoke plumes. The novel risk that COVID-19 poses merits a reduction in risk wherever possible and thus the nonsealed approach for EVH is a viable option in this regard. Moreover, the nonsealed approach may reduce the risk of vein graft thrombosis that may occur due to over-distension during CO2 insufflation. Finally, it should be noted that this approach allows for a pedicled harvest technique of the saphenous vein, which has been associated with better long-term patency. Given the technical feasibility of the nonsealed approach for EVH for both the saphenous vein and radial artery, and because there is no risk of aerosolization due to CO2 insufflation, this approach can be utilized in the COVID era to further minimize risks of viral transmission during EVH for coronary surgery.

References

1. Engelman DT, Lother S, George I, et al. Adult cardiac surgery and the COVID-19 pandemic: aggressive infection mitigation strategies are necessary in the operating room and surgical recovery. Ann Thorac Surg. 2020;110:707-711.
2. Thamboo A, Lea J, Sommer DD, et al. Clinical evidence based review and recommendations of aerosol generating medical procedures in otolaryngology—head and neck surgery during the COVID-19 pandemic. J Otolaryngol Head Neck Surg. 2020;49:28.
3. Vigneswaran Y, Prachand VN, Posner MC, Matthews JB, Hussain M. What is the appropriate use of laparoscopy over open procedures in the current COVID-19 climate? J Gastrointest Surg. 2020;24:1686-1691.
4. West CP, Montori VM, Sampathkumar P. COVID-19 testing: the threat of false-negative results. Mayo Clin Proc. 2020;95:1127-1129.
5. Kwak HD, Kim SH, Seo YS, Song KJ. Detecting hepatitis B virus in surgical smoke emitted during laparoscopic surgery. Occup Environ Med. 2016;73:857-863.
6. Morris SN, Fader AN, Milad MF, Dionisi HJ. Understanding the "scope" of the problem: why laparoscopy is considered safe during the COVID-19 pandemic. J Minim Invasive Gynecol. 2020;27:789-791.
7. Bisseri G, Muneretto C. Endoscopic saphenous vein and radial harvest: state-of-the-art. Curr Opin Cardiol. 2015;30:624-628.
8. Samano N, Geijer H, Liden M, et al. The no-touch saphenous vein for coronary artery bypass grafting maintains a patency, after 16 years, comparable to the left internal thoracic artery: a randomized trial. J Thorac Cardiovasc Surg. 2015;150:880-888.