



Lung cancer surgery during COVID-19: keep calm and operate on

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Introduction

Dolan *et al.* recently provided us with a glimpse of lung cancer surgery in a major referral center set against the backdrop of the initial peak of the COVID-19 (SARS-CoV-2) pandemic in 2020(1).

The beginning of the COVID-19 pandemic was characterized by marked uncertainty and a rapidly increasing strain on healthcare systems, as material and human resources were quickly overwhelmed (2-4). A reorganization of hospital wards was required both to insure the proper care of COVID-19 patients and to minimize the risk of viral propagation within the hospital and consequent nosocomial spread to vulnerable patients and staff (5,6). Given the repurposing of material and human resources toward critically ill COVID-19 patients and the perceived risks of the prevailing hospital environment to elective surgical patients (6), there was a de facto moratorium on elective surgical care (7,8). In fact, in March 2020, the Centers for Disease Control recommended deferring and rescheduling all elective surgical procedures (9).

A surgical moratorium

Data came to show that the risk of COVID-19-related elective surgical mortality at the beginning of the pandemic was as high as 20–50% (10), and, as Dolan *et al.* correctly point out, lung cancer patients were at a particularly high risk of COVID-19-related morbidity and mortality, both

because of pre-existing comorbidity but also because of the direct effects of surgery on the lung and the immune system (1,6). The rates of postoperative COVID-19 infection following elective lung resection ranged from 0% (1,7), to as high as 28.5% (8), while the mortality rate in these patients was upwards of 40% (3,6-8,10-12).

Guidelines were quickly developed to provide direction for the treatment of lung cancer under these conditions. The American College of Surgeons and the Thoracic Surgery Outcomes Research Network published what were perhaps the most elaborate guidelines for the triage of lung cancer patients, suggesting a 3-month deferral for nodules less than 2 cm in diameter, and longer for pure ground glass opacities, including periods of watchful waiting in highly selected cases (7,10). Several other collaborative initiatives aimed to help clinicians and institutions establish protocols adapted to their local realities, and at the institutional level, multidisciplinary tumor boards were a very important component of the decision-making process (7). Dolan *et al.* (1) provide an example of this: they developed a triage strategy based on an original scoring system to guide the decisions of a multidisciplinary team operating at the institutional level. Their strategy seems to have been flexible enough to adapt in real time to ongoing changes in the COVID-19 situation, yet rigorous enough to insure timely access to safe surgical care.

In some institutions, triage protocols included non-operative alternatives for selected cases, such as stereotactic

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radiotherapy (5,13), but also temporizing measures, such as interventional endoscopy and “off-label” or extended neo-adjuvant treatment (9). However, the substitution of unproven “workaround solutions” for standard-of-care does warrant circumspection. For starters, even beyond questions of efficacy, it is not at all clear to what extent, if any, multiple “non-operative therapeutic encounters” (12) decreased COVID-19 exposure (or in fact increased exposure) compared to an operation with a short in-hospital stay in a protected environment (2,12). And indeed there is some evidence to suggest that, for example, delayed surgery may still outperform “timely” non-surgical alternatives such as stereotactic radiotherapy in terms of overall cancer prognosis (5).

Adapting and implementing solutions

Nevertheless, the net result was a significant reduction in thoracic surgical volume in the early weeks of the pandemic in different institutions, even in specialized high volume centers (7,10). However, as the initial wave of the pandemic endured and surgical delays grew, the risk of upstaging and increased cancer mortality became an increasing concern, even for early-stage lesions (2,9). It was even suggested that lung cancer mortality may begin to outweigh the risks of COVID-19 mortality when surgical delays exceed 8 weeks (4,14), but the threshold of COVID-19 risk where this holds true remains difficult to define.

With this in mind, surgical teams reorganized their hospital environments to allow the continued care of elective surgical patients (6). Strict infection control measures were put in place for elective surgical patients. Such measures included the establishment of dedicated COVID-19-free wards (2,3,7) and protected COVID-19-free pathways(8); the adoption of strict COVID-19 screening programs for patients and staff, including PCR-testing as it became available (2,8,11); restrictions on the movements of personnel to minimize the amount and direction of comings and goings between high risk and low risk areas within the hospital (10,11); and restrictions on hospital visits, which were in many cases completely forbidden early on in the pandemic (2,3).

Likewise, it was necessary to revise operating room procedures to account for some of the unique features of thoracic surgery. First, lung surgery requires fairly extensive manipulation of the airway, both at the initiation of anesthesia and during the surgical procedure itself; secondly, the lung provides a direct route of spread of virus into the

operating room environment, through breaches of the visceral pleura and parenchymal staple lines; thirdly, virus may be spread on the postoperative ward by way of chest drainage systems in the case of active air leaks. Although screening was introduced early on (11), the possibility of spread by asymptomatic and pre-symptomatic carriers still required appropriate measures. Strict Personal Protective Equipment protocols were put in place for operating room personnel (2,3), and general protocols were instituted regulating staff movement and patient traffic. Operating room guidelines taking into account the unique features of thoracic anesthesia and lung surgery were also gradually introduced (15).

Dolan *et al.* as well as others (1,7) provide cases in point of how healthcare institutions managed to do all this effectively. In fact, many centers were able to maintain or resume a minimum volume of lung cancer surgery, and very importantly, to do so safely. Although the mortality in postoperative COVID-19 cases was high (up to around 40–50% (7,10), the incidence was kept low, often less than 5% (1,7,8,10). Remarkably, most reported post-operative COVID-19 infections seem to have occurred during the first weeks of the pandemic; postoperative COVID-19 infections became much more rare during subsequent pandemic peaks (3) in spite of surgical volumes returning to pre-pandemic levels within several months, where they remained even during subsequent waves (6). Such results no doubt speak to the resourcefulness, creativity, and diligence of surgical teams, of which there are many examples both published (1,3,6) and anecdotal.

Broader questions of cancer care

Although in the author’s opinion this should clearly be viewed as a success from a surgical perspective, one cannot consider cancer surgery outside a broader framework of cancer care. This framework includes mechanisms for primary care and specialty referral, as well as access to imaging and non-invasive and invasive testing (8,10,12). All levels of patient care were affected by the pandemic lockdowns (8). Not least of which, many patients themselves canceled or deferred medical consultation because of concerns about potential COVID-19 exposure (8,10) and indeed many self isolated for respiratory symptoms that ended up being not due to COVID-19 but to lung cancer (8). It is becoming apparent that the total volume of surgical lung cancer cases in the first pandemic year does not seem to have compensated the initial decrease in surgical activity,

suggesting some patients may have indeed “fallen through the cracks” (1,6,9). Although Dolan *et al.* were not able to account for such factors in their study, they do raise concerns over the effects of the COVID-19 pandemic on long-term lung cancer outcomes that may only become apparent in the coming years. This certainly gives us grounds for reflecting on what role we as surgeons can and should play in the delivery of cancer care on a larger scale.

Conclusion

The COVID-19 pandemic was (and in many ways continues to be) a major challenge for healthcare systems in general and the delivery of surgical care in particular. Lung cancer patients as a group are a particularly vulnerable population. While in many cases lung cancer resection early in the pandemic was associated with a significant incidence of COVID-19 morbidity and mortality, Dolan *et al.* (1) provide an example of how surgical teams were able to quickly adapt to maintain safe surgical care. As COVID-19 becomes part of the surgical landscape, the importance of committed stewardship and dedicated teamwork toward meeting ongoing and future challenges is emphasized.

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