A year at the forefront of general thoracic surgery

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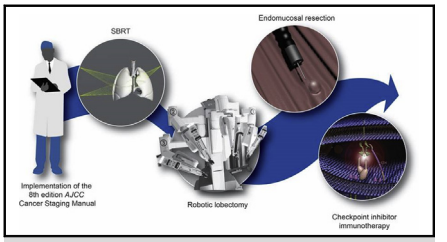

A reflection of the field of general thoracic surgery in the *Journal* in 2018.

Central Message

A compendium of articles in the *Journal* illustrate considerable advances in general thoracic surgery in the year 2018.

THOR

The field of general thoracic surgery is so deeply rooted in innovation that it has become an expectation of our surgeons and leaders. The pace of innovation in thoracic surgery has been particularly rapid in recent years, which have ushered in a wealth of meaningful advances. Through rigorous review, invited Editorial Commentaries, Original Research articles, and Feature Expert Opinion articles on developments relevant to general thoracic surgery, the *Journal* proudly offers a balanced view of progress within our field. We sought to frame the landscape of general thoracic surgery in the year 2018 by presenting noteworthy articles published in the *Journal* that year. Toward this end, we used Plum Analytics, a platform that provides insight into the ways people interact with scholarly research output in an online environment (eg, citations, social media output, media mentions). Plum Analytics gathers and provides 5 ''PlumX'' metrics of published articles based on their citations, use (eg, downloads, views, clicks), captures (eg, online readers, bookmarks, watchers), mentions (eg, blog posts, comments, news media, reviews), and social media (eg, tweets and Facebook likes). We created a cumulative ''PlumX score'' by totaling the number of occurrences in each of these categories and reviewed the 2018 *Journal* articles with the highest cumulative PlumX scores. We showcase several important 2018 *Journal* articles with high PlumX scores, acknowledging that the contributing metrics are nuanced by the length of time from article publication to the time of evaluation and that some degree of balance was endeavored by discretion of the Feature Editor. In particular, high-performing articles with similar central themes were selected to highlight the spirit of general thoracic surgery in 2018 (Figure 1).

EIGHTH EDITION AMERICAN JOINT COMMISSION ON CANCER STAGING OF NON–SMALL CELL LUNG CANCER

The 8th edition of the American Joint Commission on Cancer TNM staging system for non–small cell lung cancer (NSCLC) was implemented in January of 2018 and contains a number of distinctions compared with the prior edition. A primer on the 8th edition staging system authored by Detterbeck,[1] published as a *Journal* Feature Expert Opinion article achieved a PlumX score of 47, has since been downloaded more than 10,000 times and has been added to at least 40 online reader libraries. Elegantly described in this article are the relevant changes to NSCLC staging, including new entities such as T1mi, T1c, M1c, and stage IA1 tumors, and that tumor size is now determined by the largest dimension of the solid portion of a radiographic lesion for clinical staging and of the invasive portion of the tumor for pathologic staging.

STEREOTACTIC ABLATIVE RADIOTHERAPY

The comparative efficacy of stereotactic body radiotherapy (SABR) and surgery in the treatment of patients with NSCLC was a highly visible and opinionated theme in the field of general thoracic surgery in 2018, highlighted by 2 PlumX decorated *Journal* articles. In an article that has been cited at least 10 times (PlumX score 53), Cornwell and colleagues[2] demonstrated that thoracoscopic lobectomy was associated with improved disease control, cancer-specific survival, and overall survival, compared with SABR in a cohort of veterans with early-stage NSCLC. In an article that has been cited at least 9 times (PlumX score 27), Ajmani and colleagues[3] used the National Cancer Database to emphasize the importance of quality in wedge resection and showed that patients undergoing wedge resection with negative margins for early-stage NSCLC had a significantly reduced hazard of death compared with those undergoing SABR.[3] Both of these articles used propensity matching and other statistical approaches to eliminate bias; however, the enduring debate of surgery versus SABR is fueled by a lack of higher level evidence. After the premature closure of 3 randomized controlled clinical

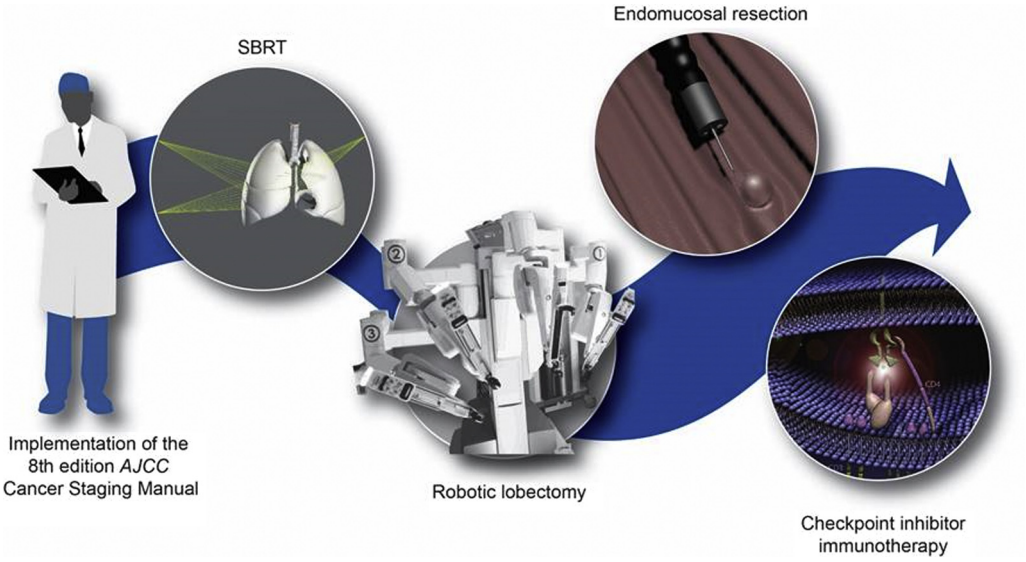

FIGURE 1. A reflection of the field of general thoracic surgery in the *Journal* in 2018. *AJCC*, American Joint Committee on Cancer; *SBRT*, stereotactic body radiation therapy.

trials comparing SABR with lobectomy in medically operable patients (ROSEL, STARS, ACOSOG Z4099), the absence of randomized data has resulted in an emergence of 2 bodies of lower-level evidence literature (one from the surgical community and one from the radiation oncology community) and a countless number of impassioned editorials and heated debates at national meetings. It is not surprising that the 4 editorial commentaries by Kidane,[4] Flores,[5] Brunelli,[6] and Moghanaki and colleagues[7] were among the most engaging, colorful, and highly recognized articles in the *Journal* this year, collectively boasting a PlumX score of 235. The limitations of the current state of this field were appropriately recognized in each of these editorials and memorialized in the refreshing evidence-based guidelines on the role of SABR in early-stage NSCLC published by the American Society for Radiation Oncology and endorsed by the American Society of Clinical Oncology.[8] After the release of these national society guidelines, the *Journal* published a primer on these recommendations via a multidisciplinary Feature Expert Opinion article by Guckenberger and colleagues[9] that is predicted to be one of the most highly recognized *Journal* articles of 2019. I would submit that in 2018, it became more apparent than ever that surgical resection is the current standard of care for medically operable patients with stage I NSCLC.

IMPROVING SHORT-TERM OUTCOMES OF NON–SMALL CELL LUNG CANCER RESECTION: ENHANCED RECOVERY AFTER SURGERY

The 2018 *Journal* article with the highest PlumX score (score of 110) at the time of our query was one centered on enhanced recovery after surgery. In their article, Rogers and colleagues[10] presented a prospective cohort study of 422 patients undergoing resection for lung cancer in the United Kingdom and demonstrated that increasing overall compliance with an enhanced recovery after surgery pathway was associated with reduction in postoperative morbidity and mortality. This article was highly ranked among citation, captured reader, and social media metrics, each in support of the importance of this contribution to the care of patients with lung cancer.

IMPROVING LONG-TERM OUTCOMES AFTER RESECTION FOR NON–SMALL CELL LUNG CANCER: MINIMALLY INVASIVE LOBECTOMY

In 2018, the largest series reporting mid-term outcomes of robotic lobectomy for NSCLC was published in the *Journal*. Cerfolio and colleagues[11] presented a series of 1339 patients who underwent operation at 4 institutions (3 in the United States and 1 in Italy), and this article achieved a PlumX score of 55 and has been cited at least 6 times. The authors presented encouraging mid-term survival results, superior to prevailing datasets of surgically treated NSCLC, including that of the International Association of the Study of Lung Cancer database from which the TNM staging system is derived. Reported rates of stage-specific 5-year survival were 83% (stage IA), 77% (IB), 68% (IIA), 70% (IIB), and 62% (IIIA).[11] While awaiting the results of longer-term follow-up, it is hard not to speculate that a minimally invasive approach to lobectomy has a favorable impact on overall survival. Perhaps more important, this article and its PlumX metrics support recognition

that robotics in thoracic surgery are increasing worldwide and will be increasingly clinically important as new robotic platforms are introduced over the next 5 years.

IMPROVING LONG-TERM OUTCOMES AFTER RESECTION FOR NON–SMALL CELL LUNG CANCER: RECURRENCE

The majority of recurrences after lobectomy for early-stage NSCLC involve distant sites. Thus, strategies for improving overall survival have included identification of patients at risk for distant metastatic disease and strategies for mitigating systemic recurrence. Toward this objective, 2 articles published in the *Journal* in 2018 achieved notoriety. In a large single-institution study of 893 patients undergoing lobectomy for T1-3N0 NSCLC in the United States, Brandt and colleagues[12] showed that pT stage and lymphovascular invasion (LVI) were independent risk factors for distant recurrence and decreased disease-free survival. This article achieved a PlumX score of 71 and has at least 8 citations. In an Eastern cohort of patients undergoing resection for stage I NSCLC, Wang and colleagues[13] also demonstrated that LVI was a risk factor for recurrence-free survival, as well as overall survival, and showed that adjuvant chemotherapy improved both of these survival metrics in patients whose tumors were positive for LVI. This article achieved a PlumX score of 26 and has at least 8 citations. The contributions from both of these *Journal* articles provide strong rationale for clinical trial investigation of adjuvant chemotherapy, targeted therapy, and immunotherapy in patients at high risk for recurrence and support National Comprehensive Cancer Network Recommendations for consideration of adjuvant chemotherapy for stage IB (T2aN0) or IIB (T2bN0) NSCLC tumors with LVI.[14]

ENDOSCOPIC MUCOSAL RESECTION

Endoscopic mucosal resection (EMR) has revolutionized the treatment of patients with intramucosal esophageal adenocarcinoma; however, comparative effectiveness data on EMR and esophagectomy are required to prevent innovation from outpacing the standard of care and to appropriately identify patients suitable for EMR. In a single-institution study published in the *Journal*, Nelson and colleagues[15] demonstrated that EMR for patients with submucosal esophageal adenocarcinoma (n = 23, all T1bN0) was associated with increased risk of local recurrence compared with those undergoing esophagectomy (n = 49). In patients with low-risk tumors (<2 cm in size, no LVI, no poor differentiation, no invasion of SM3 layer), both approaches resulted in excellent cancer control. This article achieved a PlumX score of 23 and has at least 7 citations. Marino and colleagues[16] asked a similar question of the National Cancer Database in an article with a PlumX score 27 and at least 4 citations. In propensity-matched groups of patients with T1a esophageal adenocarcinoma (n = 735 per group), equivalent survival was seen in EMR and esophagectomy, but patients who underwent esophagectomy and survived more than 90 days appeared to have longer survival. These results certainly may have been influenced by tumor-specific risk factors, including those evaluated by Nelson and colleagues,[15] and underscore the importance of thoughtful patient selection for EMR.

LOOKING FORWARD: CHECKPOINT BLOCKADE IN NON–SMALL CELL LUNG CANCER

Landmark clinical trials have demonstrated improved progression-free and overall survival in patients with advanced-stage (III and IV) NSCLC treated with immune checkpoint inhibitors,[17-19] and these agents have become standard of care for many with this disease. It is not surprising that the Feature Expert Opinion articles by Rusch and colleagues[20] and Guo and Krupnick[21] on the current state of immunotherapy for NSCLC were 2 of the most highly recognized *Journal* articles of 2018 (combined PlumX score of 99). More recently, neoadjuvant programmed death-1 blockade for patients undergoing surgical resection was proven to be safe and to induce a major pathological response in 45% of patients.[22] Neoadjuvant checkpoint inhibitor clinical trials have since become commonplace in academic centers, and thoracic surgeons are more frequently performing operations in patients after immunotherapy. One of the first articles on the safety of lobectomy after checkpoint inhibition is by Bott and colleagues,[23] published in the *Journal* in December of 2018, and is expected to prove a valuable resource for practicing thoracic surgeons. In the year ahead, we can expect to see the results of the ongoing investigation of checkpoint blockade for early-stage NSCLC brought to the readership of the *Journal* through Original Research and Feature Expert Opinion articles.

CONCLUSIONS

This is an exciting time in our field. The year 2018 has offered advances for patients with thoracic malignancies (NSCLC in particular) that are predicted to positively redirect the often less than favorable long-term survival curves that we have grown accustomed to citing. We anticipate that 2019 will be another year defined by a robust spirit of surgical innovation that the *Journal* is delighted to share with our readership.

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