Review

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Evolving Therapeutic Strategies in Esophageal Squamous Cell Carcinoma: Advances and Perspectives

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Esophageal squamous cell carcinoma (ESCC) is among the most prevalent forms of esophageal cancer globally, with a particularly high incidence in developing countries. Notably, Asia accounts for approximately 80% of global esophageal cancer cases, with China alone contributing to 54% of this burden. The primary treatment modality for ESCC remains esophagectomy, primarily employed for locally advanced disease, often in combination with chemotherapy and radiotherapy for advanced-stage cases. Despite significant advancements in surgical techniques and the advent of precision medicine, which has facilitated the development of targeted and immune-based therapies, critical challenges persist, including suboptimal therapeutic efficacy and the emergence of drug resistance. A comprehensive understanding of the current treatment landscape for ESCC is essential to overcoming these barriers and improving patient outcomes.

Key Words Esophageal squamous cell carcinoma, General Surgery, Chemotherapy, Radiotherapy

INTRODUCTION

Esophageal cancer is generally classified into two main histological subtypes: esophageal squamous cell carcinoma (ESCC) and esophageal adenocarcinoma (EAC) [1]. ESCC is the predominant type globally, particularly in developing countries, whereas EAC is more prevalent in developed nations, with a significant incidence in Western populations [2]. The rising incidence of EAC has been strongly associated with gastroesophageal reflux disease, Barrett's esophagus, obesity, and chronic acid exposure [3]. ESCC is among the most prevalent forms of esophageal cancer worldwide, particularly in developing countries [4]. Notably, Asia accounts for 80% of global cases, with China contributing 54%, underscoring the substantial patient burden in this region [5]. Clinical manifestations, including dysphagia, chest pain, retrosternal burning, weight loss, fatigue, and bleeding, pose significant challenges to treatment and complicate post-surgical recovery.

Despite advancements in surgical techniques and the development of diverse therapeutic strategies, esophageal cancer remains one of the most difficult malignancies to treat effectively [6,7]. Adjuvant chemotherapy and radiotherapy are commonly employed in advanced cases [8,9]. Furthermore, lifestyle-related factors such as smoking, alcohol consumption, malnutrition, anemia, and chronic inflammation have been identified as major risk factors for ESCC, contributing to its rising incidence in recent years [10-13]. This review provides a discussion of the roles and efficacy of surgical, chemotherapeutic, and radiotherapeutic approaches in the management of ESCC, with reference to the most recent studies.

ESOPHAGECTOMY

Esophagectomy remains the most reliable curative option for early-stage, locally advanced, and non-metastatic ESCC. Common surgical approaches include traditional open surgery and minimally invasive techniques. Traditional open surgery: techniques such as the Ivor-Lewis procedure and three-incision esophagectomy, involving cervical, thoracic, and abdominal incisions, are particularly suited for early and locally advanced cases [14,15]. Minimally invasive esophagectomy (MIE): this emerging approach utilizes thoracoscopic or laparoscopic techniques and is recommended for patients in good physical condition without extensive tumor

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invasion [16-18]. Endoscopic therapy: endoscopic mucosal resection and endoscopic submucosal dissection are preferred for early-stage lesions [19,20]. Lymphadenectomy is an integral component of esophagectomy, with notable geographical variations in practice. Western surgeons generally perform two-field lymphadenectomy, whereas three-field dissection is advocated by many Asian surgeons, particularly in Japan, for SCC [21,22]. Although debates persist regarding its associated risks and benefits, esophagectomy remains the gold standard for surgical management of ESCC [23].

An overview of the historical evolution of surgical approaches for esophageal cancer, along with their respective advantages and limitations, is presented in Figure 1 and Table 1. These findings provide a valuable framework for evaluating the progression of treatment strategies and guiding future clinical decision-making [24-28].

CHEMOTHERAPY AND RADIATION THERAPY

Chemotherapy and radiotherapy are well-established standard treatment modalities for the majority of cancers [29-31]. Specifically, for advanced ESCC, these therapies serve as essential components of treatment, often employed as adjuvant therapies following esophagectomy to mitigate the risks of recurrence and metastasis. Furthermore, for patients

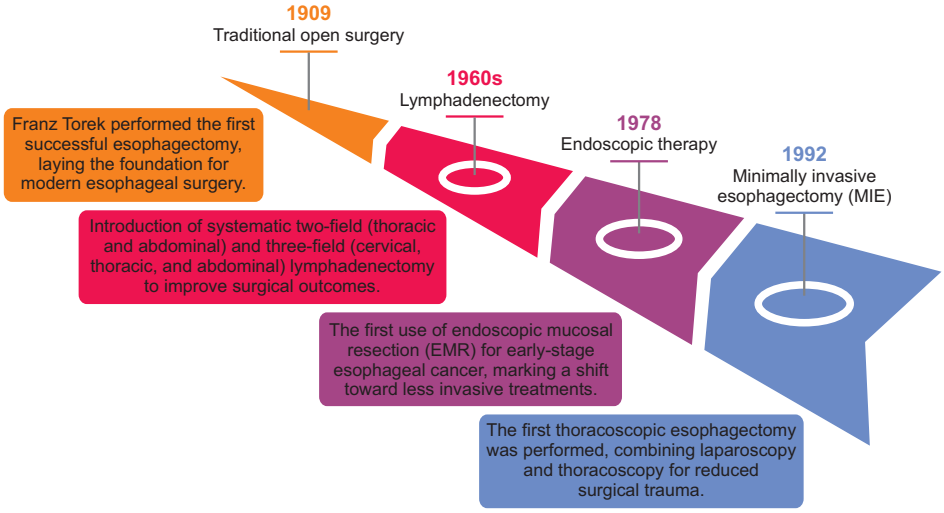

Figure 1. Timeline of esophageal cancer surgical techniques. This figure illustrates the chronological development of surgical techniques for esophageal cancer treatment. Key milestones include the first successful esophagectomy performed by Franz Torek in 1909, which laid the foundation for modern esophageal surgery. In the 1960s, systematic two-field (thoracic and abdominal) and three-field (cervical, thoracic, abdominal) lymphadenectomy were introduced to enhance surgical outcomes. The advent of endoscopic mucosal resection in 1978 marked a significant step toward less invasive treatment for early-stage esophageal cancer. By 1992, minimally invasive esophagectomy emerged, combining laparoscopy and thoracoscopy to reduce surgical traumas and improve patient recovery.

Table 1. Advantages and disadvantages of surgical techniques for esophageal cancer

Surgical technique	Advantage	Disadvantage
Traditional open surgery	- High efficacy for complete tumor removal in locally advanced cases - Established technique with predictable outcomes	- High invasiveness with significant postoperative complications, such as respiratory infections and wound issues - Prolonged recovery time
Lymphadenectomy	- Improves staging accuracy and reduces local recurrence - Three-field dissection offers superior long-term survival for specific cases	- Increased surgical complexity and operative time - Higher rates of complications, such as lymphedema and nerve injury
Endoscopic therapy (endoscopic mucosal resection/endoscopic submucosal dissection)	- Minimally invasive, with reduced risk and faster recovery - Preserves organ function, suitable for early-stage disease	- Limited to early-stage, superficial lesions - Risk of incomplete resection in larger or invasive tumors
Minimally invasive esophagectomy	- Reduced surgical trauma and blood loss - Shorter hospital stay and faster recovery	- Requires advanced surgical expertise and equipment - Limited availability in some regions due to technical demands

deemed ineligible for surgical intervention, chemotherapy and radiotherapy remain the primary therapeutic options [32]. Chemotherapeutic regimens for advanced or metastatic ESCC commonly include combinations such as cisplatin with 5-FU, paclitaxel, or docetaxel, which have been shown to prolong survival and enhance the efficacy of radiotherapy [33]. Despite these benefits, chemotherapy is limited by considerable systemic toxicities, including nausea, vomiting, alopecia, and the development of drug resistance (Table 2) [34-36]. Radiotherapy, utilizing advanced techniques such as three-dimensional conformal radiotherapy [37,38], intensity-modulated radiotherapy (IMRT) [39-41], and proton therapy, offers targeted treatment with varying levels of precision [42,43]. It is particularly effective in cases where surgery is not feasible or for addressing post-surgical residual disease. However, radiotherapy is associated with significant adverse effects, including radiation-induced esophagitis and pneumonitis (Table 3) [44-46].

Emerging evidence indicates that neoadjuvant chemoradiotherapy is highly effective for managing locally advanced ESCC [47,48]. Nonetheless, salvage esophagectomy, performed to treat residual or recurrent disease following chemoradiotherapy, carries a high risk of morbidity and mortality [32,43,49]. This underscores the importance of meticulous patient selection to optimize outcomes.

DISCUSSION

ESCC continues to present significant challenges in clinical management, particularly in regions with high incidence rates, such as Asia [50]. Despite advances in surgical techniques, chemotherapy, and radiotherapy, ESCC remains a highly aggressive cancer, with late-stage diagnoses contributing to high mortality rates [51]. One promising development in surgery is MIE, which has been shown to reduce postoperative complications and promote faster recovery compared to traditional open surgery [52,53]. However, the widespread adoption of MIE has been slow due to technical challenges and the steep learning curve associated with thoracoscopic and laparoscopic techniques. Long-term survival benefits of MIE, especially for locally advanced cases, are still under investigation, but it has already established itself as the preferred surgical option for early-stage tumors in well-selected patients [54].

Chemotherapy and radiotherapy are crucial components of ESCC treatment, especially for advanced cases [55,56]. Common chemotherapy regimens, such as cisplatin combined with 5-FU, paclitaxel, or docetaxel, have been shown to improve survival rates, particularly when combined with radiotherapy. However, these regimens are often accompanied by considerable systemic toxicities, including nausea, vomit-

Table 2. Chemotherapy for esophageal cancer: indications and pros and cons

Treatment method	Indication	Advantage	Disadvantage
Preventive agents	- Aspirin, NSAIDs and statins: high-risk populations (e.g., chronic esophagitis, Barrett's esophagus), patients with dyslipidemia or metabolic syndromes	- Reduces inflammation and carcinogenesis risk (e.g., COX-2 inhibition with aspirin) - May lower cancer incidence (e.g., statins suppress proliferation)	- Potential gastrointestinal bleeding (e.g., with NSAIDs) - Limited evidence in large-scale clinical trials
First-line chemotherapy	- Cisplatin + 5-FU: used for advanced or metastatic ESCC patients, significantly extending survival - Cisplatin + paclitaxel/docetaxel: for metastatic or recurrent ESCC, enhancing efficacy - Other combinations (e.g., irinotecan, nedaplatin): used as second-line treatment for chemotherapy-resistant patients	- Extends survival for advanced or metastatic patients - Preoperative chemotherapy reduces tumor size, improving surgical outcomes - Effective in combination with radiation therapy for better local control	- Significant side effects: nausea, vomiting, hair loss, immunosuppression, etc. - Potential drug resistance with long-term use, reducing effectiveness - Limited efficacy for some late-stage patients, especially those with chemotherapy-resistant tumors
Neoadjuvant chemotherapy	- Locally advanced esophageal cancer patients, preoperative chemotherapy shrinks tumors, enhancing resection success	- Shrinks tumors, improving chances for successful surgery	- Toxicity risks similar to first-line chemotherapy
Adjuvant chemotherapy	- Postoperative patients, used to clear micrometastases and reduce recurrence risk	- Reduces recurrence by clearing residual cancer cells	- Side effects: nausea, fatigue, and long-term toxicity
Chemoradiotherapy combined	- For inoperable advanced esophageal cancer patients, combining chemotherapy and radiotherapy to enhance local control	- Improves local control, especially for non-surgical patients	- Increased side effects due to combination therapy

NSAID, nonsteroidal antiinflammatory drugs; ESCC, esophageal squamous cell carcinoma.

Table 3. Radiation therapy for esophageal cancer: indications and pros and cons

Treatment method	Indication	Advantage	Disadvantage
Three-dimensional conformal radiotherapy	- Locally advanced or inoperable patients, can precisely target tumor areas	- Non-invasive; effective for patients who cannot undergo surgery	- Potential side effects include radiation-induced esophagitis and pneumonia
IMRT	- Tumors in complex locations or near critical structures, IMRT optimizes dose distribution and reduces damage to normal tissues	- Precise targeting reduces radiation exposure to surrounding tissues	- Requires advanced technology and may still lead to side effects, especially if not optimally targeted
Proton therapy	- For tumors in complex locations or recurrence after radiation therapy, proton therapy provides higher precision	- Higher precision in targeting tumors, reducing damage to surrounding tissues	- Expensive and limited availability in some regions
Chemoradiotherapy combined	- For locally advanced or inoperable patients, chemoradiotherapy improves treatment outcomes and survival rates	- Enhanced local control and survival rates when chemotherapy is combined with radiotherapy	- Increased side effects due to the combination of chemotherapy and radiation therapy

IMRT, intensity-modulated radiotherapy.

ing, alopecia, and drug resistance [57,58]. Innovations in radiotherapy, such as IMRT and proton therapy, have improved treatment precision, reducing damage to healthy tissues and minimizing side effects like radiation-induced esophagitis and pneumonitis [59].

Neoadjuvant chemoradiotherapy has emerged as an effective treatment for locally advanced ESCC, with evidence suggesting it can reduce tumor size and improve surgical outcomes [60,61]. However, salvage esophagectomy after neoadjuvant therapy remains a high-risk procedure, necessitating careful patient selection and monitoring. Looking ahead, the development of personalized therapies based on molecular profiling and the use of targeted therapies and immunotherapies, such as immune checkpoint inhibitors, offer potential breakthroughs in improving treatment outcomes, particularly for metastatic ESCC. These advancements could revolutionize ESCC treatment, providing new hope for patients with limited options.

CONCLUSION

In conclusion, treatment strategies for ESCC, as with other cancers, are tailored to the stage of the disease and the tumor's characteristics. MIE has emerged as the preferred approach for early-stage ESCC, offering effective tumor resection with reduced invasiveness and minimized injury to surrounding tissues. In cases of advanced ESCC, chemotherapy and radiotherapy serve as critical components, either as adjuvant therapies or as standalone treatment modalities. Additionally, neoadjuvant and salvage therapies expand the range of options available, though their risks and benefits require careful consideration. Continued advancements in research and the development of precision medicine are expected to further enhance and individualize the management of ESCC.

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CONFLICTS OF INTEREST

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REFERENCES

1. Sheikh M, Roshandel G, McCormack V, Malekzadeh R. Current status and future prospects for esophageal cancer. Cancers (Basel) 2023;15:765.
2. Zhang HZ, Jin GF, Shen HB. Epidemiologic differences in esophageal cancer between Asian and Western populations. Chin J Cancer 2012;31:281-6.
3. Kong CY, Nattinger KJ, Hayeck TJ, Omer ZB, Wang YC, Spechler SJ, et al. The impact of obesity on the rise in esophageal adenocarcinoma incidence: estimates from a disease simulation model. Cancer Epidemiol Biomarkers Prev 2011;20:2450-6.
4. Codipilly DC, Wang KK. Squamous cell carcinoma of the esophagus. Gastroenterol Clin North Am 2022;51:457-84.
5. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin 2021;71:209-49.
6. Dehdashti F, Siegel BA. Neoplasms of the esophagus and stomach. Semin Nucl Med 2004;34:198-208.
7. Kato H, Fukuchi M, Miyazaki T, Nakajima M, Tanaka N, Inose T, et al. Surgical treatment for esophageal cancer. Current issues.

Dig Surg 2007;24:88-95.
8. Ando N, Kato H, Igaki H, Shinoda M, Ozawa S, Shimizu H, et al. A randomized trial comparing postoperative adjuvant chemotherapy with cisplatin and 5-fluorouracil versus preoperative chemotherapy for localized advanced squamous cell carcinoma of the thoracic esophagus (JCOG9907). Ann Surg Oncol 2012;19:68-74.
9. Waters JK, Reznik SI. Update on management of squamous cell esophageal cancer. Curr Oncol Rep 2022;24:375-85.
10. Gavin AT, Francisci S, Foschi R, Donnelly DW, Lemmens V, Brenner H, et al. Oesophageal cancer survival in Europe: a EUROCARE-4 study. Cancer Epidemiol 2012;36:505-12.
11. Huang FL, Yu SJ. Esophageal cancer: risk factors, genetic association, and treatment. Asian J Surg 2018;41:210-15.
12. Chen W, Zheng R, Zeng H, Zhang S, He J. Annual report on status of cancer in China, 2011. Chin J Cancer Res 2015;27:2-12.
13. Arnold M, Laversanne M, Brown LM, Devesa SS, Bray F. Predicting the future burden of esophageal cancer by histological subtype: international trends in incidence up to 2030. Am J Gastroenterol 2017;112:1247-55.
14. Wright CD. Esophageal cancer surgery in 2005. Minerva Chir 2005;60:431-44.
15. Rentz J, Bull D, Harpole D, Bailey S, Neumayer L, Pappas T, et al. Transthoracic versus transhiatal esophagectomy: a prospective study of 945 patients. J Thorac Cardiovasc Surg 2003;125:1114-20.
16. Bograd AJ, Molena D. Minimally invasive esophagectomy. Curr Probl Surg 2021;58:100984.
17. van der Sluis PC, Schizas D, Liakakos T, van Hillegersberg R. Minimally invasive esophagectomy. Dig Surg 2020;37:93-100.
18. Groth SS, Burt BM. Minimally invasive esophagectomy: direction of the art. J Thorac Cardiovasc Surg 2021;162:701-4.
19. Wang KK, Prasad G, Tian J. Endoscopic mucosal resection and endoscopic submucosal dissection in esophageal and gastric cancers. Curr Opin Gastroenterol 2010;26:453-8.
20. Prasad GA, Wu TT, Wigle DA, Buttar NS, Wongkeesong LM, Dunagan KT, et al. Endoscopic and surgical treatment of mucosal (T1a) esophageal adenocarcinoma in Barrett's esophagus. Gastroenterology 2009;137:815-23.
21. Tachibana M, Kinugasa S, Yoshimura H, Shibakita M, Tonomoto Y, Dhar DK, et al. Clinical outcomes of extended esophagectomy with three-field lymph node dissection for esophageal squamous cell carcinoma. Am J Surg 2005;189:98-109.
22. Walther B, Johansson J, Johnsson F, Von Holstein CS, Zilling T. Cervical or thoracic anastomosis after esophageal resection and gastric tube reconstruction: a prospective randomized trial comparing sutured neck anastomosis with stapled intrathoracic anastomosis. Ann Surg 2003;238:803-12; discussion 812-4.
23. Marmuse JP, Koka VN, Guedon C, Benhamou G. Surgical treatment of carcinoma of the proximal esophagus. Am J Surg 1995;169:386-90.
24. Akiyama H, Tsurumaru M, Udagawa H, Kajiyama Y. Radical lymph node dissection for cancer of the thoracic esophagus. Ann Surg 1994;220:364-72; discussion 372-3.
25. Torek F. The first successful resection of the thoracic portion of the esophagus for carcinoma: preliminary report. JAMA 1913;60:1533.
26. Ponchon T. Endoscopic mucosal resection. J Clin Gastroenterol 2001;32:6-10.
27. Soetikno RM, Gotoda T, Nakanishi Y, Soehendra N. Endoscopic mucosal resection. Gastrointest Endosc 2003;57:567-79.
28. Cuschieri A, Shimi S, Banting S. Endoscopic oesophagectomy through a right thoracoscopic approach. J R Coll Surg Edinb 1992;37:7-11.
29. Zhang H, Ma L, Kim E, Yi J, Huang H, Kim H, et al. Rhein induces oral cancer cell apoptosis and ROS via sppresse AKT/mTOR signaling pathway in vitro and in vivo. Int J Mol Sci 2023;24:8507.
30. Ma L, Huang K, Zhang H, Kim E, Kim H, Liu Z, et al. Imatinib inhibits oral squamous cell carcinoma by suppressing the PI3K/AKT/mTOR signaling pathway. J Cancer 2024;15:659-70.
31. Ma L, Liu Z, Kim E, Huang K, Kim CY, Kim H, et al. Parishin A inhibits oral squamous cell carcinoma via the AKT/mTOR signaling pathway. Pharmaceuticals (Basel) 2024;17:1277.
32. Baskar R, Lee KA, Yeo R, Yeoh KW. Cancer and radiation therapy: current advances and future directions. Int J Med Sci 2012;9:193-9.
33. Minsky BD, Pajak TF, Ginsberg RJ, Pisansky TM, Martenson J, Komaki R, et al. INT 0123 (Radiation Therapy Oncology Group 94-05) phase III trial of combined-modality therapy for esophageal cancer: high-dose versus standard-dose radiation therapy. J Clin Oncol 2002;20:1167-74.
34. Kobayashi K. [Chemotherapy-induced diarrhea]. Gan To Kagaku Ryoho 2003;30:765-71. Japanese.
35. Zraik IM, Heß-Busch Y. [Management of chemotherapy side effects and their long-term sequelae]. Urologe A 2021;60:862-71. German.
36. Ai D, Ye J, Wei S, Li Y, Luo H, Cao J, et al. Comparison of 3 paclitaxel-based chemoradiotherapy regimens for patients with locally advanced esophageal squamous cell cancer: a randomized clinical trial. JAMA Netw Open 2022;5:e220120.
37. Qin Q, Ge X, Wang X, Wang L, Li C, Chen J, et al. Stage III esophageal squamous cell carcinoma patients with three-dimensional conformal or intensity-modulated radiotherapy: a multicenter retrospective study. Front Oncol 2020;10:580450.
38. Fan XW, Wu JL, Wang HB, Liang F, Jiang GL, Wu KL. Three-dimensional conformal radiation therapy alone for esophageal squamous cell carcinoma: 10-year survival outcomes. Thorac Cancer 2019;10:519-25.
39. Tian X, Hou Y, Guo J, Wu H, Nie L, Wang H, et al. Effect of intensity modulated radiotherapy on lymphocytes in patients with esophageal squamous cell carcinoma and its clinical significance. Front Oncol 2023;13:1096386.
40. Lin WC, Chang CL, Hsu HL, Yuan KS, Wu ATH, Wu SY. Three-dimensional conformal radiotherapy-based or intensity-modulated radiotherapy-based concurrent chemoradiotherapy in patients with thoracic esophageal squamous cell carcinoma.

Cancers (Basel) 2019;11:1529.
41. Zhang W, Liu X, Xiao Z, Wang L, Zhang H, Chen D, et al. Efficacy of intensity-modulated radiotherapy for resected thoracic esophageal squamous cell carcinoma. Thorac Cancer 2015;6:597-604.
42. Oh ES, Moon SH, Lee Y, Ahn BC, Lee JY, Suh YG, et al. Treatment outcomes of proton beam therapy for esophageal squamous cell carcinoma at a single institute. Cancers (Basel) 2023;15:5524.
43. Lertbutsayanukul C, Kitpanit S, Kannarunimit D, Chakkabat C, Oonsiri S, Thephamongkhol K, et al. High-dose intensity-modulated proton therapy versus standard-dose intensity-modulated radiation therapy for esophageal squamous cell carcinoma (HI-SIRI): study protocol for a randomized controlled clinical trial. Trials 2022;23:897.
44. van Heijl M, van Lanschot JJB, Koppert LB, van Berge Henegouwen MI, Muller K, Steyerberg EW, et al. Neoadjuvant chemoradiation followed by surgery versus surgery alone for patients with adenocarcinoma or squamous cell carcinoma of the esophagus (CROSS). BMC Surg 2008;8:21.
45. Xi M, Lin SH. Recent advances in intensity modulated radiotherapy and proton therapy for esophageal cancer. Expert Rev Anticancer Ther 2017;17:635-46.
46. Verma V, Moreno AC, Lin SH. Advances in radiotherapy management of esophageal cancer. J Clin Med 2016;5:91.
47. Fiorica F, Di Bona D, Schepis F, Licata A, Shahied L, Venturi A, et al. Preoperative chemoradiotherapy for oesophageal cancer: a systematic review and meta-analysis. Gut 2004;53:925-30.
48. van Hagen P, Hulshof MC, van Lanschot JJ, Steyerberg EW, van Berge Henegouwen MI, Wijnhoven BP, et al. Preoperative chemoradiotherapy for esophageal or junctional cancer. N Engl J Med 2012;366:2074-84.
49. Tachimori Y, Kanamori N, Uemura N, Hokamura N, Igaki H, Kato H. Salvage esophagectomy after high-dose chemoradiotherapy for esophageal squamous cell carcinoma. J Thorac Cardiovasc Surg 2009;137:49-54.
50. Liang H, Fan JH, Qiao YL. Epidemiology, etiology, and prevention of esophageal squamous cell carcinoma in China. Cancer Biol Med 2017;14:33-41.
51. Xie R, Cai Q, Chen T, Huang H, Chen C. Current and future on definitive concurrent chemoradiotherapy for inoperable locally advanced esophageal squamous cell carcinoma. Front Oncol 2024;14:1303068.
52. Straatman J, van der Wielen N, Cuesta MA, Daams F, Roig Garcia J, Bonavina L, et al. Minimally Invasive versus open esophageal resection: three-year follow-up of the previously reported randomized controlled trial: the TIME trial. Ann Surg 2017;266:232-36.
53. Yerokun BA, Sun Z, Yang CJ, Gulack BC, Speicher PJ, Adam MA, et al. Minimally invasive versus open esophagectomy for esophageal cancer: a population-based analysis. Ann Thorac Surg 2016;102:416-23.
54. Gottlieb-Vedi E, Kauppila JH, Malietzis G, Nilsson M, Markar SR, Lagergren J. Long-term survival in esophageal cancer after minimally invasive compared to open esophagectomy: a systematic review and meta-analysis. Ann Surg 2019;270:1005-17.
55. Ohashi S, Miyamoto S, Kikuchi O, Goto T, Amanuma Y, Muto M. Recent advances from basic and clinical studies of esophageal squamous cell carcinoma. Gastroenterology 2015;149:1700-15.
56. Gong H, Li B. Guidelines for radiotherapy of esophageal carcinoma (2020 edition): branch of Radiation Oncology Therapists, Chinese Medical Association; Society of Radiation Oncology Therapy, Chinese Medical Association; Cancer Radiotherapy Committee of China Anti-Cancer Association. Precis Radiat Oncol 2021;5:54-72.
57. Stathopoulos GP, Antoniou D, Dimitroulis J, Michalopoulou P, Bastas A, Marosis K, et al. Liposomal cisplatin combined with paclitaxel versus cisplatin and paclitaxel in non-small-cell lung cancer: a randomized phase III multicenter trial. Ann Oncol 2010;21:2227-32.
58. Xu L, Chen X, Wang L, Han J, Wang Q, Liu S, et al. Paclitaxel combined with platinum (PTX) versus fluorouracil combined with cisplatin (PF) in the treatment of unresectable esophageal cancer: a systematic review and meta-analysis of the efficacy and toxicity of two different regimens. J Gastrointest Oncol 2023;14:1037-51.
59. Strojan P, Hutcheson KA, Eisbruch A, Beitler JJ, Langendijk JA, Lee AWM, et al. Treatment of late sequelae after radiotherapy for head and neck cancer. Cancer Treat Rev 2017;59:79-92.
60. Sui X, Danzeng D, Ni P, Geng J, Gesang P, Zhaxi R, et al. Neoadjuvant immunotherapy plus chemotherapy in high altitude natives with resectable esophageal squamous cell carcinoma in Tibet [published online ahead of print December 6, 2024]. Asian J Surg. doi: 10.1016/j.asjsur.2024.11.134
61. Huang R, Qiu Z, Zheng C, Zeng R, Chen W, Wang S, et al. Neoadjuvant therapy for locally advanced esophageal cancers. Front Oncol 2022;12:734581.