Lifetime Follow-Up of a Patient with Metastatic Prostate Cancer Undergoing Multiple Surgical Resections: A Case Report

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Patient: Male, 88-year-old
Final Diagnosis: Lung metastasis from prostate cancer
Symptoms: None
Clinical Procedure: Surgery
Specialty: Surgery
Objective: Rare disease
Background: Prostate cancer (PC) often metastasizes after primary resection, and long-term survival following surgical resection of multiple pulmonary metastases is rare. We present a case of a surgeon who demonstrated long-term survival after overcoming repeated surgical challenges for multiple pulmonary metastases from PC.

Case Report: Twenty-six years ago, a 62-year-old man initially reported discomfort during urination. A prostate examination revealed mildly elevated prostate-specific antigen (PSA) levels. Six months later, PC was diagnosed, and a radical prostatectomy was performed, revealing moderately differentiated adenocarcinoma but no vessel infiltration. At 9 years after the operation, three 10-mm nodules were detected in the right lung. Then, surgical biopsy by wedge pulmonary resection revealed metastatic PC, and therefore, right lower lobectomy including all nodules was planned. Although postoperative maintenance with luteinizing hormone–releasing hormone agonists kept the low PSA levels for 3 years, other newly limited metastases were observed in the opposite left lung, necessitating more surgeries of partial left lung resection. Six years later, a third lung metastasis was detected, as well as mild increases in the tumor size and PSA level, and the patient died 26 years after the initial PC intervention because of malnutrition for 1 year after sustaining bone compression fractures due to a fall, and not due to PC progression.

Conclusions: Repeated surgical resections for slow-growing metastatic pulmonary PC was an alternative treatment that facilitated favorable survival and a good quality of life for 26 years in the present case.

Keywords: Thoracoscopy • Neoplasm Metastasis • Prostatic Neoplasms • Cancer Survivors • Prognosis • Housing for the Elderly

Abbreviations: PSA – prostate-specific antigen; PC – prostate cancer; VATS – video-assisted thoracic surgery

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**Background**

Prostate cancer (PC) is a common malignancy occurring among elderly men. Its incidence has increased, according to the average life expectancy worldwide, including that of Japan [1]. After the primary resection of locally advanced PC, the prevalence of distant metastasis, as bone metastasis, is often observed [2]. In distant metastasis from PC, pulmonary metastasis can be clinically rare, and its adequate treatment remains uncertain [3,4]. In the recent era of novel systemic chemotherapy, surgical resection for the multiple distant metastases or rapid progressive recurrent PC must be avoided. Meanwhile, some patients demonstrated that pulmonary metastasis occurs in small solitary regions, with slow growth. Although surgical resection of solitary or few metastases is controversial in patients with PC, minimally invasive pulmonary resection remains the treatment of choice for local surgical resection, from the perspective of thoracic surgery [4]. In this case report, the urological surgeon firstly performed the primary surgical resection for PC and found that a few nodules of pulmonary metastasis localized in the same segment region occurred after the long-term follow-up of 6 years. Herein, we report a rare case of a metachronously recurring pulmonary PC in a patient who decided to undergo multiple aggressive surgeries aimed at achieving good prognosis.

**Case Report**

A 62-year-old male patient, who was a surgical practitioner at a clinic, experienced discomfort in the tip of the penis during urination but without pain. In the prostate examination, a mild increase in tumor markers, such as prostate-specific antigen (PSA) levels (6.2 ng/mL; the normal upper limit was 4) and a stony hard lesion found by the physician’s palpation, were observed; however, the mass was not detected by transrectal ultrasonography. Six months later, PC was diagnosed, and the patient underwent radical prostatectomy. There were no lung nodules at this stage. Pathological findings revealed moderately differentiated adenocarcinoma without vessel infiltrations but with capsular infiltration (T3N0M0; stage C; Figure 1), according to the American Joint Committee on Cancer in 1992 [5], and adjuvant hormonal therapy of both LH–RH agonist antiandrogen drug therapy was provided for 9 years. At 9 years after surgery, three 10-mm sized nodular lesions were detected in the right lower lung field by chest X-ray and computed tomography (CT), owing to the patient’s request to check for distant metastases of PC, but there were no other lung nodules at this stage. As the radiological findings revealed intralobar lymph nodes, because lung metastasis was very rare (Figure 2A), surgical biopsy by video-assisted thoracic surgery (VATS) was performed. Eventually, the patient underwent right lower lobectomy because the intraoperative pathology results indicated multiple metastatic PC of well-differentiated adenocarcinomas (Figure 2B-2D). Although the LH–RH agonist was postoperatively maintained and the PSA level was controlled at 0.08 ng/mL during the follow-up period for 3 years after the first lung resection, another 10-mm lung metastasis was newly identified in segment 3 of the opposite left upper lung on follow-up CT, which was performed every 6 months (Figure 3), necessitating additional VATS segmentectomy. Also in the following year, 3 years after the second lung resection, another

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**Figure 1.** A 25-mm ill-defined mass lesion with capsular infiltration was observed in the right lobe of the prostate (white arrow).
6-mm recurrence in the left lower lobe again appeared, which was partially resected because it was a solitary nodule and because it was the patient’s request (Figure 4). At 6 years following the final resection, 3 newly recurred lung nodules (maximum 10 mm) were identified in both upper lung lobes, and these were observed without endocrine therapy, because of adverse effects such as constipation. In the course, other distant metastases were not clinically identified, and the patient still underwent open cholecystectomy for acute cholangitis during the follow-up. He lived well by working as a clinical doctor with a certification as an industrial physician and commuted a 1-hour drive daily. No osteoporosis was noted in his regular checkups. Two years before death, because the tumor of the left upper lung lobe increased to its maximum size of 25 mm accompanied with a PSA level of >3 ng/mL, enzalutamide, as a new androgen, was administrated by the urologist’s recommendation, and 2 month later, the patient had multiple thoracic compression fractures, which subsequently occurred 3 times within 4 months. His quality of life became dramatically impaired, and he later died because of anomalotrophy by bowel impairments after fractures 26 years after the first intervention for PC. The remnant metastatic lung cancer remained with slight enlargement to 30 mm in the right upper lobe of the lung at the final stage (Figure 5).

Discussion
As described above, the common distant metastasis from PC is bone metastasis, while a previous study has reported that...
lung metastases were observed by autopsy in 12% to 38% of cases [1] and clinically identified by chest X-ray in 5% to 7% of cases [1-4]. However, reports regarding solitary lung metastasis from PC are few [3,4,6,7]. Pulmonary metastasis from PC, which has a mechanism that can be hematogenous or lymphatic or nodular, tends to be formed by the hematogenous mechanism via pelvic venous infiltration [1-4]. The primary PC in the present case demonstrated no vessel infiltration; however, capsular infiltration affected metastasis. In 2006, detecting lung metastasis by chest X-ray was rare. In the mid-2000s, CT functions dramatically changed, as thin slices with high resolution by spiral canning and a tiny mass legion could be detected, compared with scanning in the 1990s [8,9]. In the present study, a follow-up chest X-ray was performed annually, and

Figure 3. Subsequent metastases were identified in the left upper lobe of the lung, which were aggressively resected by video-assisted thoracic surgery segmentectomy (white arrow).

Figure 4. The third metastatic lung cancer, which was partially resected (white arrow).

Figure 5. The final recurring multiple metastatic lung cancers in both lungs without any treatment interventions (white arrow).
the resolution of chest CT had developed during this period of follow-up. Thus, the tiny lung metastasis might have existed before the first finding. The mild increase of the PSA level was an opportunity to determine metastasis by chest CT, and therefore, change in the PSA level was the most sensitive marker, as was the follow-up of cancer recurrence. Based on the urological surgeon’s comment in 2006 and the National Comprehensive Cancer Network guidelines of 2010 (https://www2.tri-kobe.org/nccn/guideline/archive/urological2010/comment/prostate.html), surgical interventions are not recommended for lung metastases. When the first metastatic round mass lesions existed locally, inter-lobar lymph nodes were highly suspected by the radiologist, owing to the patient’s childhood history of pleuritis. However, the patient desired pulmonary resection biopsy, and the adenocarcinoma was diagnosed by intraoperative histological findings. Thus, we performed a right lower lobectomy of the lung, considering primary lung carcinoma. However, whether these lesions could be controlled by the hormonal chemotherapy alone was uncertain. Eventually, additional lung partial resections were subsequently performed despite the patient’s old age, unless there was impairment of general status or co-morbidity. The present patient was healthy until 86 years old and could tolerate multiple surgeries. Because the tumor grew slowly only in the lung and the recurring tumors could be resected by minimal invasive surgeries based on the patient’s strong desire for surgical resection, 3 separate lung resections were uncharacteristically selected. Further, his request for surgeries to avoid the adverse effects of chemotherapy markedly influenced the thoracic surgeon’s surgical decision, rather than any protocol. In this era, elderly patients over 80 years, with good organ function and general status, have received radical operations or anti-cancer drug therapy for several malignancies, including advanced-stage PC [10]. Recently, minimal invasive surgery using VATS provides a less invasive alternative for elderly patients [11]. As the patient underwent pulmonary lobectomy in the 2000s, it was fortunate that such an improvement in surgical procedures had occurred. We were very surprised to encounter the increased ability of this elderly patient after VATS lobectomy and additional segmentectomy. Moreover, although occult lung metastases remained, the disease has been stable without requiring hormonal chemotherapy, thus improving the patient’s prognosis. However, when the new anti-androgen drug enzalutamide had been recently introduced, the urologist recommended using this drug for preventing tumor growth because the PSA level and metastatic tumor size were mildly increased. However, the patient had multiple thoracic compression fractures at 2 months after the administration of the hormonal drug therapy. The cause of the fractures remains unclear. Steroids, hormonal drug therapy, or other chemotherapy-induced fragile spinal compression fracture are possible causes [12]. Furthermore, we hope to clarify specific molecular markers in order to determine, among other things, new diagnostic and treatment concepts regarding cancer growth behaviors, drug and radiation resistance, contraindications of local treatments, and the possibility of oligometastasis being a good surgical indication in this time of increasing elderly patients [13,14]. Nevertheless, elderly patients have a good general status or quality of life in this era. Thus, physicians should pay careful attention when selecting any medical interventions influencing organ impairments by considering the patient’s entire medical history. Once complications or adverse effects occur, patients with advanced aged, such as those in their late 80s, may not be able to recover as well as younger patients.

Conclusions

We report the case of a long-time survivor with metachronous multiple lung metastases that originated from PC. The patient decided to aggressively undergo multiple surgical resections by less-invasive thoracic surgery, with hormonal chemotherapy and careful follow-up by himself, as a surgeon. This unusual case followed a successful and fortunate course, and the intervention of multiple surgical resections was an ideal approach to increase patient survival despite metastatic PC. Use of adjuvant chemotherapy or standardized treatment modalities must be thoroughly discussed with each individual patient by considering the balance between quality of life and oncological tumor control in patients of advanced aged with any malignancies.

Acknowledgments

The present report was affectionately dedicated to this patient as an honorable surgeon from his son, who is a principal author who closely monitored this patient’s cancer management for 26 years. In each situation, the patient confronted his long-term future living with cancer, and the authors highly respected his thoughtful determination as a surgeon patient. Through this report, I would like to say, “Goodbye, father, and I wish to be with you always”.

Declaration of Figures’ Authenticity

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