Case Report

Surgery to Avoid Stoma Construction in Invasive Prostate Cancer Extensively Infiltrating the Rectum

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Abstract
A 61-year-old man tested positive for occult urinary and fecal occult blood and was diagnosed with invasive prostate cancer extensively infiltrating the rectum. After scrutiny, he was diagnosed with cT4N1M0 prostate cancer, and androgen deprivation therapy (ADT) was initiated with a gonadotropin-releasing hormone antagonist. A prostatic rectal resection was performed 6 months after ADT began. The bladder and urethra were anastomosed, the anus was preserved intact, and the sigmoid colon was anastomosed to the anus. A temporary ileostomy was constructed to allow eating and to prevent fistula formation. The ileostomy was closed 5 months post-operation as the patient wanted to live without a stoma. Although the patient died of other disease factors, he remained untreated for 1 year and 7 months post-operation, and his symptoms and disease control were well supported. We report that we were able to perform stoma-free surgical treatment for prostate cancer extensively infiltrating rectum.

Introduction
Prostate cancer with rectal infiltration has been reported to have a poor prognosis. Androgen deprivation therapy (ADT) is the first treatment choice, with a response rate of 70–80% [1]. Unfortunately, rectal symptoms appear as the disease progresses and may cause...
intestinal obstruction, reducing patients’ quality of life. Generally, the 2-year survival rate without local treatment is approximately 40%, but it has been reported that the prognosis is ≥3 years with local treatment [1, 2]. Herein, we report the case of a patient treated with surgery for invasive prostate cancer that extensively invaded the rectum to improve prognosis and support a stoma-free life.

Case Presentation

The patient was a 61-year-old man who noted thinner stools than usual on defecation for >1 year. Subsequently, urinary and fecal occult blood was detected upon examination, but lower gastrointestinal endoscopy failed to identify tumors. Due to prostate-specific antigen (PSA) blood levels of 39.5 ng/mL, prostate magnetic resonance imaging was conducted, and prostate cancer was suspected. The patient was referred to our department for detailed examination and treatment. Rectal endoscopy showed a thickening of the circumference below the peritoneal reflection (Rb) 6 cm. It was difficult to reverse the endoscope due to the hardening effect of the fibrosis present (shown in Fig. 1a–c). Gastrointestinal tumor markers were negative, and rectal mucosal biopsy showed no malignancy. During the digital rectal examination, the prostate felt hard and lacked mobility. A transrectal prostate biopsy was performed (shown in Fig. 1d), and a Gleason score of 3 + 5 = 8 adenocarcinoma was detected. We diagnosed prostate cancer as rectal infiltration Winter classification type II based on the results mentioned above. Computed tomography showed swelling of the right external iliac lymph node, and the diagnosis was cT4N1M0 prostate cancer.

We initiated ADT with a gonadotropin-releasing hormone antagonist for the patient. After 5 months, the PSA level decreased to 0.92 ng/mL, magnetic resonance imaging showed tumor shrinkage, and rectal stenosis improved (Fig. 1e, f).

At 6 months post-treatment, the patient underwent combined resection of the prostate and rectum. The operation proceeded with a lower abdominal skin incision and retropubic prostatectomy (Fig. 2a). The urethra and prostate and the bladder and prostate were transected, and only the rectal side was not detached. Enlarged lymph node dissection was performed in the pelvis. The inter-sphincteric resection (ISR) method was performed for rectum resectioning. The sigmoid colon and rectum were mobilized and exfoliated, preserving the superior hypogastric and pelvic plexuses. The rectum and anus were dissected from the dentate line, between the internal and external anal sphincters, and the detachment was advanced to allow traffic to the abdominal cavity. Intraoperative rapid pathological examination was performed using the rectum tissue on the dorsal side of the seminal vesicles, and it was confirmed that there was no obvious cancer tissue present. The rectum was amputated at the sigmoid level, and the prostate and rectum were removed in a single mass (shown in Fig. 3a, b). The colorectal surgeons performed all rectal surgeries.

Bladder-urethral and colon-anal anastomoses were created. Next, a gracilis flap was guided into the abdominal cavity from the perineum and placed between the bladder and the colon (Fig. 2b, c). Plastic surgeons obtained the gracilis flap from the left thigh (shown in Fig. 2d).

An ileostomy was constructed, assuming it would be closed in the future. Finally, surgical castration was performed. The operation time was 11 h and 5 min, and the amount of bleeding was 1,079 mL, including urine. Postoperative complications included the development of bilateral lower leg compartment syndrome (Clavien-Dindo classification grade IIIa) because of the long-term lithotomy position. Decompressive fasciotomy was performed on the same day. The pathological result was GS 4 + 5 = 9, EPE1, RM0, Ly0, V0, pn1, Sv1, ypN+(1/9), and the therapeutic effect was grade I or higher (shown in Fig. 3c–f).
Post-operation, the diet was resumed on postoperative day (POD) 5, the urethral catheter was removed at POD14, and the patient was incontinent, but no difficulty in urination was observed. The PSA level dropped to below 0.01 ng/mL during postoperative follow-up without treatment, and the ileostomy closure was performed 5 months post-surgery. The PSA level increased to 0.26 ng/mL 6 months post-operation, and oral administration of bicalutamide was started. The PSA level remained below 0.1 ng/mL 1-year post-operation. The patient had residual numbness in the lower extremities, but his urinary incontinence improved to a padless condition, and he was able to defecate through the anus without any problems.

Unfortunately, advanced gastric cancer with liver metastasis was diagnosed 1 year and 3 months post-surgery, and the patient died 4 months after diagnosis. This was 2 years and 1 month after the treatment began and 1 year and 7 months post-surgery (shown in Fig. 4). After the diagnosis of gastric cancer, oral administration of bicalutamide was discontinued, but the patient did not suffer from urination or defecation problems until death.

**Discussion**

The Winter classification classifies the rectal infiltration mode of prostate cancer, and this case is classified as type II, which is peripheral submucosal infiltration (shown in Fig. 5) [3]. According to the statistics, type II was the most common type accounting for 40.6% of all cases; however, in some cases, the contour of the prostate is not noticeable in the image, and it may be difficult to diagnose without experience in similar cases. Generally, local treatment is not suggested when prostate cancer invades other organs, and androgen-targeted therapy is the first choice. The response rate of androgen-targeted therapy is 70–80%, and Yanagida
Fig. 2. a Illustration of this technique, excision image. b Illustration of this technique, image after anastomosis. c Still image of gracilis flap, insert a gracilis flap into the pelvis from the perineum. d Still image of gracilis flap, gracilis muscle released from the left thigh.

Fig. 3. a, b Pathological specimen and histopathological image, extracted specimen. c Pathological specimen and histopathological image, cancer cells whose activity has decreased due to ADT. d Pathological specimen and histopathological image, castration-resistant, highly active cancer cells. e, f Pathological specimen and histopathological image, fibrosis of the rectal wall, and some Gleason grade 5 cancer cells under the mucosa.
et al. [2] reported a 2-year survival rate of 41.7%. Yanagida et al.'s [2] report is an era when there were no new therapeutic drugs, but the prognosis appears to have improved now. However, in type II rectal infiltration, symptoms due to rectal stenosis appear as the condition progresses, and finally, artificial anus construction is needed.

Recently, various uses of local treatment for prostate cancer with oligo metastasis have been reported [4]. Local treatment has also been associated with prolonged overall survival in cT4 prostate cancer [5]. Furthermore, it has been reported that local treatment for rectum-infiltrating prostate cancer also prolongs the prognosis [1]. Local treatment mainly involves total pelvic exenteration, and there are no reports on local treatments that eventually result in no stoma. The present study is the first case report presenting the use of surgery to avoid a stoma in rectum-infiltrating prostate cancer. The operation was long, and complications occurred, but the disease control was good for over 2 years from the treatment until the patient died of other factors; there was no major problem with defecation and urination either. Local treatment is useful in symptomatology and disease control for invasive prostate cancer extensively infiltrating the rectum. Since the rectal infiltration of prostate cancer causes rectal stenosis, conventional methods result in a permanent stoma. However, in recent years, ISR has provided a sphincter-saving surgery that preserves the external sphincter and reconstructs the anus, and it is finally possible to live without a stoma [6]. The combination of ISR and bladder-urethral anastomosis presents a problem: the risk of fistula formation at each anastomosis, which significantly reduces patients’ quality of life. Therefore, we decided to use variously reported gracilis flaps to avoid fistula formation at the anastomotic site. Gracilis flaps are often used to close pelvic fistulas, and good results have been reported [7, 8]. Computed tomography, 2 months post-operation, showed that the gracilis flap was located between the bladder and sigmoid colon, and the enhancement with the contrast medium was
good. In addition, it was thought that the role of a spacer for irradiation could be expected if local recurrence occurs around the urethra post-surgery.

The problem is that the operation time becomes more prolonged, and the risk of complications, as in this case, increases because the gracilis flap is collected. Furthermore, this procedure is limited to large-scale facilities due to the need for urologists and colorectal and plastic surgeons.

There was no consensus on the timing of the surgery, and it was scheduled for 6 months after ADT treatment began. The surgery was scheduled once a decrease in the PSA level was confirmed and the images improved Kumar et al. [9] reported a significantly lower positive margin rate in localized or locally advanced prostate cancer patients who received 6 or 8 months of preoperative hormone therapy. As time passes from the start of treatment, the tumor becomes active and resistant to castration, and the risk of the tumor becoming persistent after surgery is considerably higher. Therefore, surgical intervention should be performed between 6 months to 1 year after treatment begins. In this case, irradiation was considered an option for local treatment, but it was judged that the risk of complications was high because the irradiation range was wide.

**Conclusion**

Prostate cancer is more likely to occur in the peripheral zone region and may invade the dorsal side, resulting in rectal infiltration. Rectal infiltration is particularly prone to rectal stenosis in Winter classification type II, making defecation difficult and often requiring stoma construction. In this case, prostatic rectal resection and anus formation/bladder-urethral anastomosis were performed to prolong the prognosis and avoid future stoma construction. Unfortunately, the patient died of other factors, but a good long-term course could be expected. Although this surgical procedure is uncommon during the surgical invasion and has a considerable risk of complications, we believe that it can be an optional treatment strategy for rectum-infiltrating prostate cancer, which is said to have a poor prognosis. We would like to continue similar surgical treatment for patients with rectum-infiltrating prostate cancer.

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Statement of Ethics

The Ethics Committee of Yamagata Prefectural Central Hospital approved this study for a case report (approval number 10). Written informed consent was obtained from the patient and patient’s next of kin to publish the details of their medical case and any accompanying images.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

Conception or design of the work: Yuki Katsumata, Takeshi Suto, and Kenji Numahata. Interpretation of data for the work: Kotaro Otake, Shinta Suenaga, Masato Konno, Kento Morozumi, and Senji Hoshi. Drafting of the paper: Yuki Katsumata and Kenji Numahata. Critical revision of the paper: Yuki Katsumata and Kenji Numahata.

Data Availability Statement

All data generated or analyzed during this study are included in this article. Further enquiries can be directed to the corresponding author.

References

1. Wang H, Yao Y, Li B. Factors associated with the survival of prostate cancer patients with rectal involvement. Diagn Pathol. 2014;9(1):35.
2. Yanagita T, Hasui Y, Uehara K, Kitada S, Osada Y, Marutsuka K, et al. Clinical evaluation of rectal involvement by prostatic cancer. Nisshin J Urol. 1993;55:1419–23.
3. Winter C. The problem of rectal involvement by prostatic cancer. Surg Gynecol Obstet. 1957;105(2):136–40.
4. Kim J, Park JS, Ham WS. The role of metastasis-directed therapy and local therapy of the primary tumor in the management of oligometastatic prostate cancer. Invest Clin Urol. 2017 Sep;58(5):307–16.
5. Kim AH, Konety B, Chen Z, Schumacher F, Kutikov A, Smaldone M, et al. Comparative effectiveness of local and systemic therapy for T4 prostate cancer. Urology. 2018;120:173–9.
6. Yamada K, Ogata S, Saiki Y, Fukunaga M, Tsuji Y, Takano M. Long-term results of intersphincteric resection for low rectal cancer. Dis Colon Rectum. 2009;52(6):1065–71.
7. Palmer JA, Vernon CP, Cummings BJ, Moffat FL. Gracilis myocutaneous flap for reconstructing perineal defects resulting from radiation and radical surgery. Can J Surg. 1983;26(6):510–2.
8. Voss JN, Crick AP, Rees RW. Urethro-cutaneous fistula repair using a combination of buccal mucosal graft and pedicled gracilis muscular flap for high risk patients. Urol Case Rep. 2019;23:37–8.
9. Kumar S, Shelley M, Harrison C, Coles B, Wilt TJ, Mason MD. Neo-adjuvant and adjuvant hormone therapy for localised and locally advanced prostate cancer. Cochrane Database Syst Rev. 2006;2010(4):Cd006019.