

Radiologic complications in a long-term survivor with Wilms tumor: a case report

Toshihiro Yasui, MD^{a,*}, Tatsuya Suzuki, MD, PhD^a, Makoto Urano, MD, PhD^b, Sayumi Tahara, MD^b, Makoto Kuroda, MD, PhD^b, Fujio Hara, MD, PhD^a, Shunsuke Watanabe, MD, PhD^a, Naoko Uga, MD^a, Atsuki Naoe, MD^a, Yasuhiro Kondo, MD^a, Tomonori Tuchiya, MD^a

Abstract

Wilms tumor is a child-specific cancer with a 5-year survival rate exceeding 90%. We report the case of a 48-year-old man who survived after he was diagnosed with Wilms tumor at 3 years but died due to a circulatory disorder after radiation therapy. At 34 years of age, he was diagnosed with arteriosclerosis obliterans. He received interventional radiology twice, but his vascular stent became occluded. Finally, septic shock occurred and he died. Our case study shows that the mortality risk of circulatory system increases with age in childhood cancer survivors, and they should be advised to lead healthy lifestyles.

Keywords: Wilms tumor, Cardiovascular disease, Radiation therapy

Background

In the last decades, the 5-year survival rate of patients with childhood cancer has improved. However, the long-term survival of these patients is prevented by factors such as tumor recurrence, second primary cancer, circulatory diseases, and respiratory diseases^[1]. Wilms tumor (WT) is a pediatric-specific cancer, with a 5-year survival rate of > 90%^[2,3]. Since the 1970s, treatment for WT has been chemotherapy, radiation therapy (RT), and operation. Although the British Childhood Cancer Survivor Study (BCCSS) has reported that the mortality risk of circulatory disorders in patients with childhood cancer increases with age^[1], the actual mechanism underlying the development of these complications remains unclear. We report the case of a man, who was diagnosed with WT at 3 years of age, which was treated. However, he died at 48 years of age due to circulatory disorders due to RT, and we present his clinical course, therapeutic regimens and autopsy findings in this report.

Departments of ^aPediatric Surgery and ^bDiagnostic Pathology, Fujita Health University School of Medicine, Toyoake, Aichi, Japan

This manuscript has been peer reviewed.

Sponsorships or competing interests that may be relevant to content are disclosed at the end of this article.

*Corresponding author. Address: Department of Pediatric Surgery, Fujita Health University School of Medicine, 1-98 Dengakugakubo, Kutsukake-cho, Toyoake, Aichi 470-1192, Japan. Tel.: +81-562-93-9247; fax: +81-562-93-1951. E-mail address: t-yasui@fujita-hu.ac.jp (T. Yasui).

Copyright © 2019 The Authors. Published by Wolters Kluwer Health, Inc. on behalf of IJS Publishing Group Ltd. This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

International Journal of Surgery Oncology (2019) 4:e74

Received 1 April 2019; Accepted 21 April 2019

Published online 20 May 2019

<http://dx.doi.org/10.1097/IJ9.000000000000074>

We report the caution of the treatment against for long-term pediatric cancer survivors and provide appropriate advice and information regarding their condition.

Case report

A 48-year-old man was diagnosed with WT at 3 years of age, for which he underwent nephrectomy, chemotherapy, and RT. We could not determine the details of his therapy from his chart or from his family. He developed ileus at 5 years of age, for which he underwent multiple abdominal surgeries.

At adulthood, he became a smoker. Because his bowel adhesion was very strong, he was told that he could not be operated upon anymore. He complained of abdominal pain several times and could not eat solid food because strong bowel adhesion gradually prevented foods from passing through his small intestine and colon (Figs. 1A, B). He consumed only water and an amino acid-rich elemental diet. At 34 years of age, he complained of intermittent claudication and was diagnosed with arteriosclerosis obliterans. Contrast-enhanced computed tomography showed that his abdominal aorta and left iliac artery were narrowing due to atherosclerosis and that the superior mesenteric artery was occluded (Figs. 1C, D). He complained of severe abdominal pain and diarrhea, for which he was started on central venous nutrition from 42 years of age. At 47 years of age, he underwent interventional radiology (IVR) (Fig. 2). Following this intervention, the frequency of abdominal pain increased from once a month to once a week, and he had to be admitted in the hospital. A skin ulcer developed on his left knee, and his left iliac artery was occluded again because of stent thrombosis. Although he received another IVR on the same side, his left iliac artery was occluded again. Once the skin ulcer on his left knee was cured after IVR, the left knee deteriorated and skin ulcers and necrosis developed on other parts of the body, such as left toes, buttocks, and perineum (Fig. 3).

Initially, analgesia was provided for his abdominal and leg pain by the administration of acetaminophen, tramadol, and nonsteroidal anti-inflammatory agents. However, his pain could not be controlled, and he was started on fentanyl by continuous intravenous infusion at

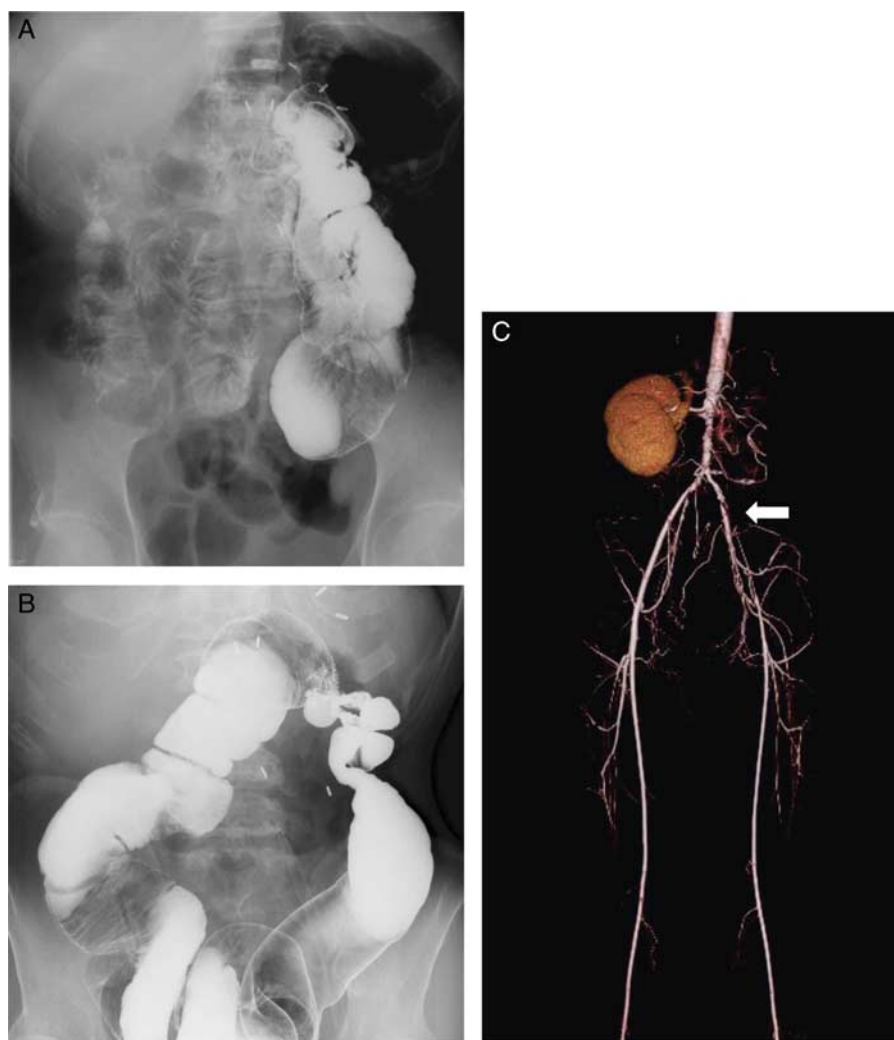


Figure 1. A and B, Upper gastrointestinal series showed his fixed small intestinal shape. Irrigoscopy showed strong stenosis in his descending colon. C, His abdominal aorta and left iliac artery were narrowing with atherosclerosis. The superior mesenteric artery was completely occluded and could not be observed. His small intestine and colon received blood flow by collateral feeding (arrows show the narrowing location of the left iliac artery).

0.3 $\mu\text{g}/\text{kg}/\text{h}$ and flurbiprofen at 150 mg/d. Despite all these medications, the pain could not be completely controlled. He developed urinary retention, for which a urethral catheter was inserted, but the perineum became necrotic. Consequently, septic shock occurred due to urinary tract or bacterial infection from bedsore lesions, and he subsequently died.

An autopsy showed that his bowels and abdominal wall had strongly adhered and that stents from the abdominal aorta to the left iliac artery were completely occluded (Fig. 4). Two major infectious lesions were noted at the perineum and buttocks. Gross and microscopic images showed multiple septic changes in the lungs, heart, and spleen, which were observed as diffuse alveolar damage, dilatation of the right ventricle, and white suppurative nodules on the splenic surface, respectively. There was no evidence of malignancy.

Discussion

Currently, the health care transition for childhood cancers is a complex and challenging concern. In Japan, some adult patients

are still examined by pediatric consultants or pediatric surgeons. Although there are long-term WT survivors, their long-term outcomes have not been reported. The BCCSS and other European countries have reported that the causes of death for long-term WT survivors are subsequent malignant neoplasms, cardiac diseases, end-stage renal diseases, and pulmonary diseases. However, these causes have not been researched in depth.

Although RT for WT has improved the 5-year survival rate, this therapy also has late side-effects^[4]. Whole abdominal irradiation causes both radiation enteropathy and peripheral artery diseases^[5,6]. Jurado et al^[6] reported that balloon angioplasty with or without stenting should be considered as a treatment of choice in patients with radiation-induced carotid artery disease. However, in our patient, we presume the irradiation range in his therapy was not limited and vascular damage became fatal in a short period of time. His abdominal pain originated from superior mesenteric artery obstruction, insufficient collateral circulation for his bowels, and bowel obstruction. Bowel obstruction is reported a common complication of RT of the

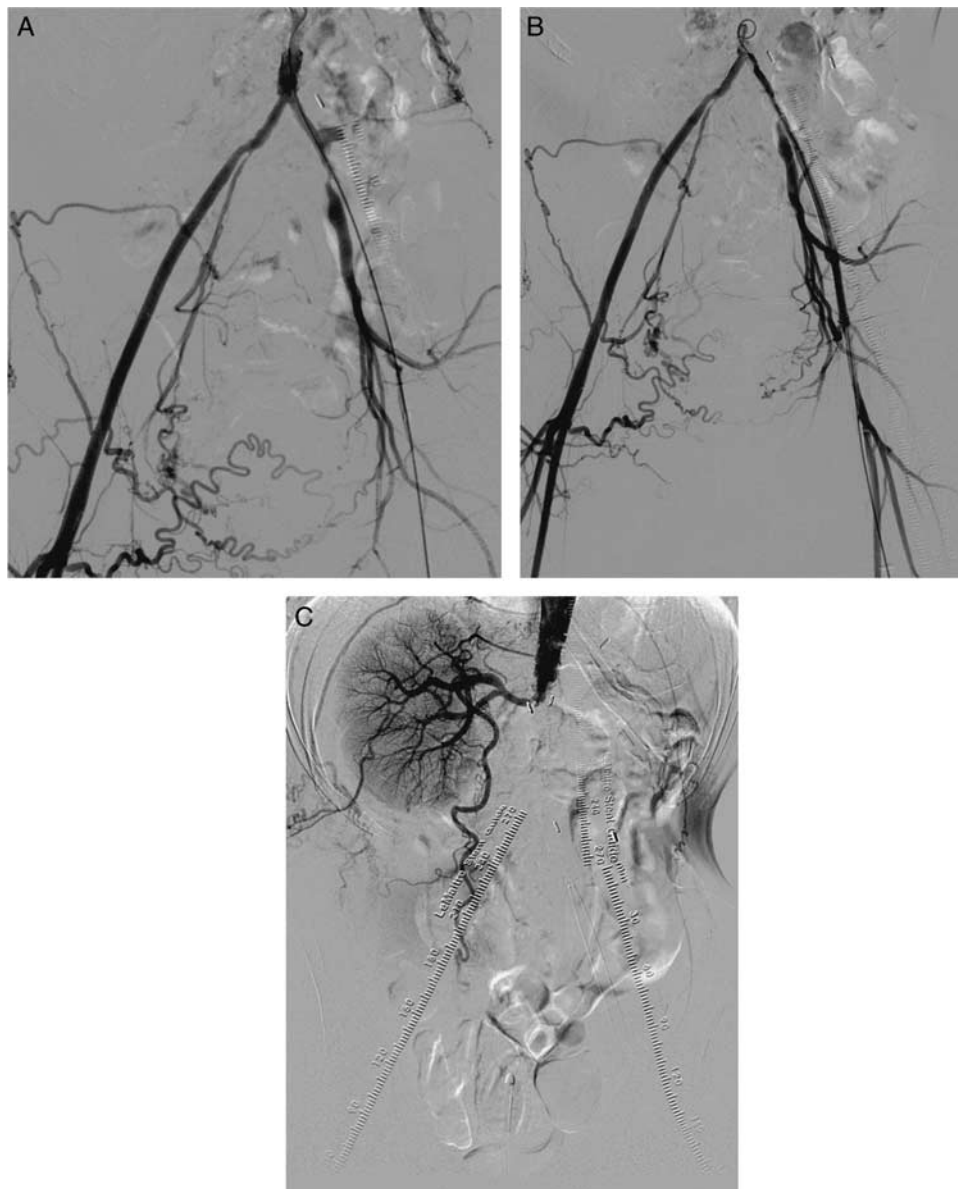


Figure 2. A and B, First interventional radiology (IVR) assessments. The condition before dilation (A) and (B) shows the condition after dilation. His left iliac artery was dilated using a balloon with a stent inside. The vascular stent became occluded within few months. C, Second IVR. Collateral blood flow was observed from the right renal artery to the bowel and the lower limbs. During IVR, the right renal artery was injured, and we placed stents inside both iliac arteries and the abdominal aorta.

gastrointestinal tract^[5]. In the present case, RT and repeated abdominal surgery caused bowel obstruction. After he received IVR, his intestinal blood stream changed and abdominal pain frequently occurred. Gillbert and Byard^[7] have reported that fatal ischemic enteritis is a late complication in WT survivors. Therefore, we recommend that long-term variable hemodynamics must be carefully treated. The irradiation-induced enteropathy and peripheral artery disease in some cases can cause fatal conditions. In addition to RT, we believe that our patient's smoking worsened his iliac artery atherosclerosis. Many studies have reported smoking is a major risk of peripheral artery disease^[8]. Smoking induces oxidative stress, vascular inflammation and platelet coagulation. Patients who have received treatment during childhood have less health-related knowledge, and

such patients and their lifestyles should be carefully monitored, and they should receive regular health advice.

Although we cannot determine the number of patients who suffer from vascular complications after RT, some patients may complain of abdominal or foot pain. Initially, we used acetaminophen and loxoprofen as analgesics for our patient. However, the pain could not be controlled after his stents were occluded. Finally, we started narcotics for analgesia and achieved a good control in the beginning. However, some adverse events related to narcotics occurred—one of them being urinary retention^[9]. Because of this complication, we had to insert a urethral catheter that led to perineum necrosis, urinary tract infection, and sepsis.

In conclusion, long-term pediatric cancer survivors should be monitored and treated by multidisciplinary teams, and their

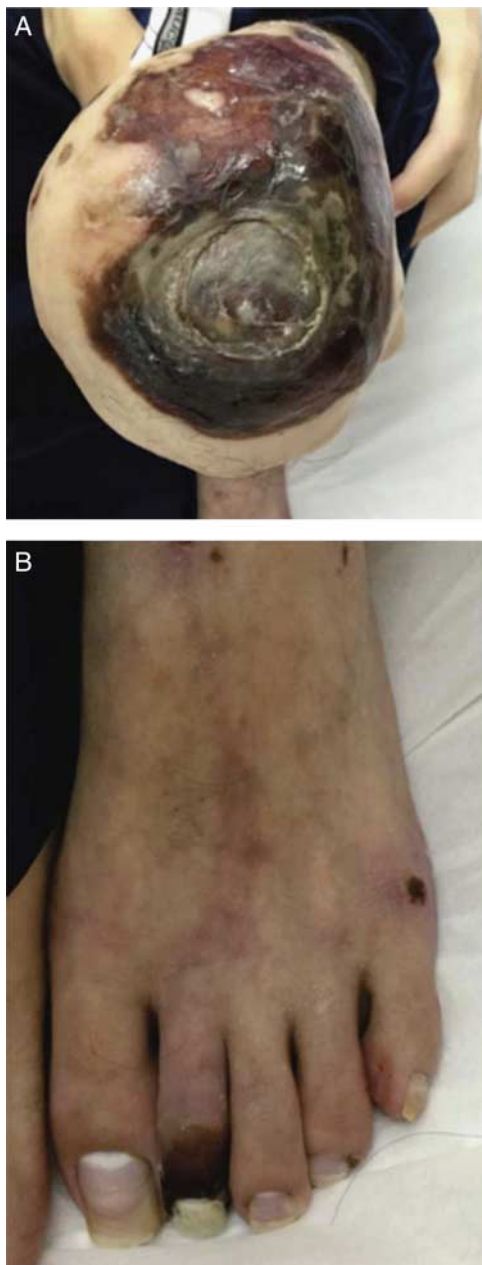


Figure 3. His left knee (A) and toe (B) became necrotic due to vascular insufficiency.

health should be carefully managed according to their age. The incidence of cardiovascular disorders is bound to increase, and patients with such risks should be provided appropriate advice and information regarding their condition.

Ethical approval

Our study is according acceptable research standards.

Sources of funding

The authors did not receive any funding.

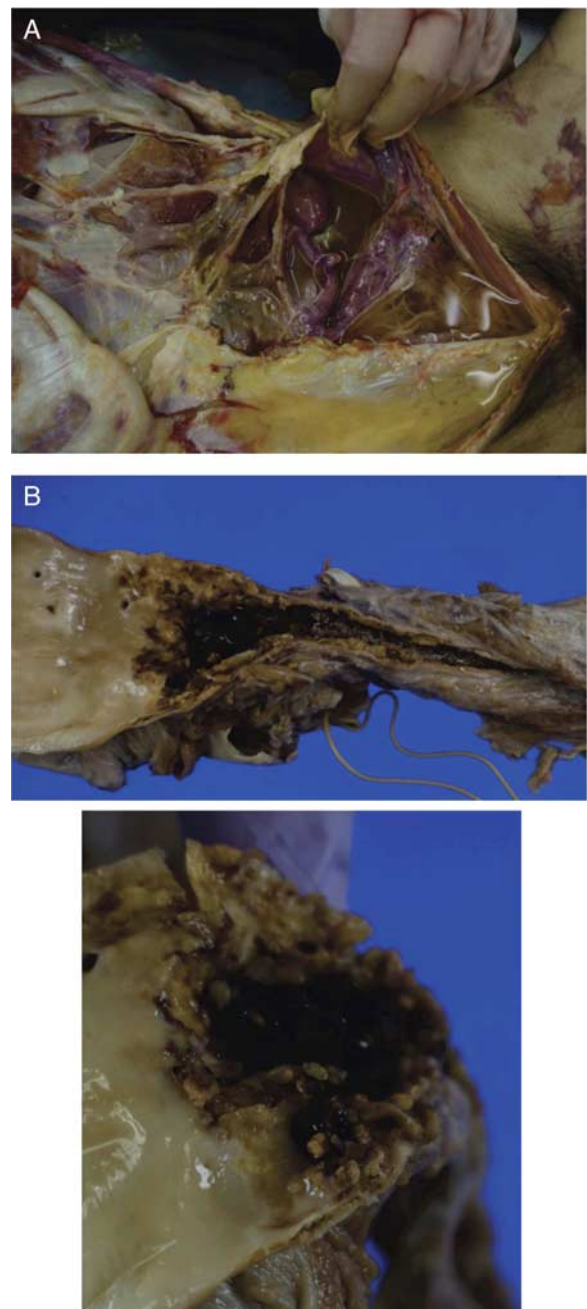


Figure 4. A, His bowels and abdominal wall showed strong adhesion. B, The stents from abdominal aorta to the left iliac artery was completely occluded.

Author contribution

The authors would like to thank Makoto Urano, Sayumi Tahara, and Makoto Kuroda for the autopsy findings. The other authors were responsible for his treatment.

Conflicts of interest disclosure

The authors declare that they have no financial conflict of interest with regard to the content of this report.

Research registration unique identifying number (UIN)

This study does not have any unique identifying number.

Guarantor

There are no guarantor in this study.

Acknowledgments

The authors would like to thank the patient and his family. The patient wanted his treatment progress to be reported in his lifetime, and, therefore, he consented to having his pictures taken and provided permission to dissect. His family cooperated for the interviews and provided all the required information.

References

- [1] Reulen RC, Winter DL, Frobisher C, *et al.* Long-term cause-specific mortality among survivors of childhood cancer. *JAMA* 2010;304:172–9.
- [2] Termuhlen AM, Tersak JM, Liu Q, *et al.* Twenty-five year follow-up of childhood Wilms tumor: a report from the childhood Cancer Survivor Study. *Pediatr Blood Cancer* 2011;57:1210–6.
- [3] Cotton CA, Peterson S, Norkool PA, *et al.* Early and late mortality after diagnosis of wilms tumor. *J Clin Oncol* 2009;27:1304–9.
- [4] Paulino AC, Wen BC, Brown CK, *et al.* Late effects in children treated with radiation therapy for Wilms' tumor. *Int J Radiat Oncol Biol Phys* 2000;46:1239–46.
- [5] Wang J, Boerma M, Fu Q, *et al.* Significance of endothelial dysfunction in the pathogenesis of early and delayed radiation enteropathy. *World J Gastroenterol* 2007;13:3047–55.
- [6] Jurado JA, Bashir R, Burket MW. Radiation-induced peripheral artery disease. *Catheter Cardiovasc Interv* 2008;72:563–8.
- [7] Gilbert JD, Byard RW. Fatal ischemic enteritis with hemorrhage—a late complication of treated Wilms tumor. *J Forensic Sci* 2013;58:234–6.
- [8] National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health. The health consequences of smoking—50 years of progress: a report of the surgeon general. Atlanta, GA: Centers for Disease Control and Prevention (US); 2014.
- [9] de Boer HD, Detriche O, Forget P. Opioid-related side effects: postoperative ileus, urinary retention, nausea and vomiting, and shivering. A review of the literature. *Best Pract Res Clin Anaesthesiol* 2017;31:494–504.