

## When Chemotherapy Is Not Enough—Management of Prostatic Embryonal Rhabdomyosarcoma in an Infant

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A baby boy was diagnosed with embryonal rhabdomyosarcoma causing left hydronephrosis. A loop ureterostomy was performed, and the infant was treated per the RMS13 protocol. After 3 months of chemotherapy, the infant's tumor burden increased, and he underwent radical cystoprostatectomy and right-to-left transureteroureterostomy (end-to-end fashion utilizing the distal limb of his ureterostomy). This innovative method was utilized because the infant's tumor burden was too large to be treated effectively and safely with radiation. One year later, the infant has no evidence of disease. This demonstrates that optimal management of rhabdomyosarcoma is still unknown; therefore, each child warrants an individualized approach for optimal outcomes. UROLOGY 113: 200–202, 2018. © 2017 Elsevier Inc.

Rhabdomyosarcoma (RMS) accounts for up to 15% of all solid pediatric tumors.<sup>1</sup> Of these tumors, up to 20% arise from genitourinary organs.<sup>1</sup> Several factors, including site and histology, affect survivability, but overall, today's outcomes are markedly improved from the historically reported 25%.<sup>2</sup> This improvement is a result of ongoing research into the most effective treatment strategies with the least associated morbidities.

The RMS13 protocol<sup>3</sup> at St. Jude Children's Research Hospital, in which our patient is enrolled, is an example of one such endeavor. Children diagnosed with RMS who have not received prior radiation or chemotherapy are placed into low-, intermediate-, or high-risk groups based on the size of the tumor, the location of the mass, and the presence or the absence of metastasis. For low-risk patients, the objective is to identify the most effective treatment with the least amount of therapy. In the other 2 groups, the goal is to determine if adding maintenance chemotherapy will delay or prevent recurrence of their tumors. The chemotherapeutic agents used and their timings differ between the groups. Additionally, the low-risk patients undergo surgery followed by radiation after week 11, whereas the intermediate- and high-risk groups receive radiation without excision. If a child in either of the 2 lower categories experience disease progression before week 13, they

may cross over to the high-risk group (Fig. 1). Our child, however, is an example of the need to individualize treatment plans to optimize outcomes.

### CASE REPORT

A 4-month-old full-term, previously healthy baby boy was evaluated by his pediatrician for abdominal firmness noticed by his parents during bathing. Ultrasound demonstrated a large, multilobulated, solid mass invading the left sacral foramen and compressing the left ureter, causing hydronephrosis (Fig. 2A,B). Four days later, the infant underwent bone marrow biopsy and aspiration, cystoscopic tumor biopsy, and port placement.

The infant was subsequently referred to St. Jude Children's Research Hospital with a diagnosis of group III, stage III non-MYCN amplified embryonal RMS without bone marrow disease. Antegrade ureteral stent placement by interventional radiology was unsuccessful because of the tortuosity of the ureter and extrinsic compression (Fig. 2C); thus, a percutaneous nephrostomy tube was placed. Chemotherapy was initiated per the RMS13 protocol (intermediate-risk arm), and urology was consulted for the management of the infant's hydronephrosis, as the protocol does not permit any patient to be discharged with an externalized foreign body while undergoing active treatment.

After discussion with his parents, the infant underwent left cutaneous loop ureterostomy rather than remaining inpatient with a nephrostomy tube for the entirety of his treatment. He was discharged 2 days later and continued his chemotherapy regimen.

A magnetic resonance imaging performed after week 11 showed an increase in the size of the infant's pelvic disease (Fig. 2D). Per the protocol, the baby should have

*This is a Pediatric Urologic Oncology Working Group case submission that was solicited by Urology.*

**Financial Disclosure:** The authors declare that they have no relevant financial interests.

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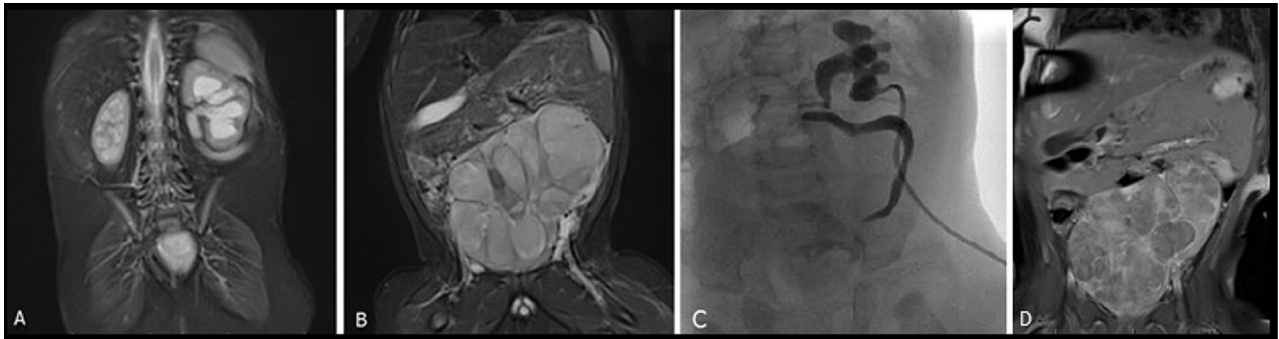
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Submitted: August 1, 2017, accepted (with revisions): October 24, 2017

## RMS13 PROTOCOL

- Low-risk (Groups I and II)
    - Chemotherapy (weeks 1-40)
    - Timing differs between groups
    - Agents
      - Vincristine
      - Dactinomycin
      - Cyclophosphamide
    - Surgery – week 11
    - Radiation – weeks 13-18
  - Intermediate Risk (Group III)
    - Chemotherapy agents and timing per Group II
    - Radiation at week 13 or week 4 (depending on disease site)
    - Maintenance therapy (after week 43)
      - Bevacizumab
      - Sorafenib
      - Cyclophosphamide
  - High Risk (Group IV)
    - Chemotherapy (50 weeks)
      - Vincristine
      - Irinotecan
      - Ifosfamide
      - Etoposide
      - Doxorubicin
      - Dactinomycin
      - Cyclophosphamide
    - Radiation – week 20
    - Maintenance per Group III
- Low- or intermediate-risk patients with disease progression → high-risk arm

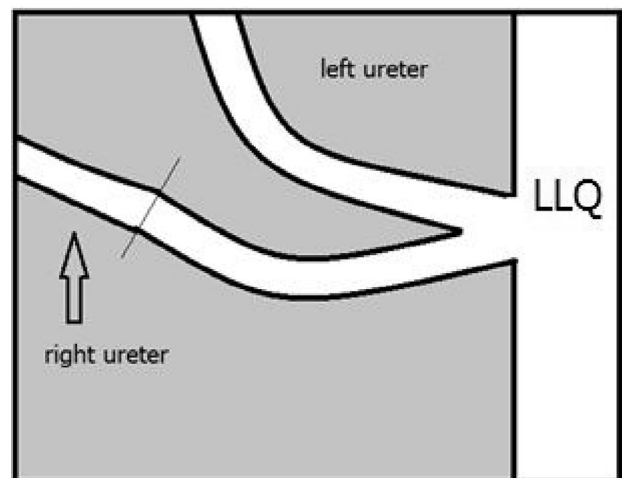
**Figure 1.** Overview of the RMS13 protocol. Our patient was enrolled in the intermediate arm. (Color version available online.)



**Figure 2.** (A,B) Hydronephrosis secondary to compression by the large mass. (C) Antegrade nephrostogram demonstrating the futility of the attempted stent placement. (D) Increased tumor burden after week 11 of chemotherapy.

crossed over into the high-risk arm to receive radiation and increased chemotherapy; however, it was discussed with his parents that radiation alone seemed a poor option because of the size of the tumor burden. Collectively, it was believed that the patient would do best with an extirpative procedure; thus, he underwent radical cystoprostatectomy. Intraoperatively, it was felt that a right-to-left transureteroureterostomy with stent placement would best manage his urinary drainage while minimizing morbidity. This procedure was done in an end-to-end fashion utilizing the distal limb of the previously created cutaneous loop ureterostomy (Fig. 3).

The infant did very well after surgery, and was discharged 4 days later and continued his chemotherapy regimen. The pathology results confirmed the presence of tumor in the prostate with extension into the bladder; however, the surgical margins and 3 resected lymph nodes were negative, thus negating the need for adjuvant radiation. The infant's most recent magnetic resonance imaging, completed 1 year post surgery, shows no evidence of disease.



**Figure 3.** After radical cystoprostatectomy, the patient's right ureter was anastomosed (end-to-end) to the distal limb of his previously created left loop ureterostomy. This drains into a urostomy bag in the baby's LLQ. LLQ, left lower quadrant.

He is now being followed up with serial imaging. His parents have chosen to forego maintenance treatment.

## DISCUSSION

Historically, treatment for RMS involved radical surgery. The contemporary approach involves biopsy with subsequent chemotherapy with or without radiation with a goal of cure and organ preservation.<sup>1,4-6</sup> This goal cannot always be achieved, however, and it is important to recognize when the risks outweigh the benefit. Increasing the odds for a child's survival certainly offsets any reconstructive surgery that is required. Additionally, radiation, which allows for bladder preservation, is itself fraught with its own late effects and complications.<sup>2,6,7</sup>

There are several options for urinary diversion and reconstruction, and the procedure chosen is based on the age and the overall health of the child, the extent of resection that was required, and the capability of the caregivers.<sup>4,5,8</sup> Our unique surgical method does not follow the traditional approach of using bowel to create a continent or an incontinent reservoir. It was, however, born out of a need to remove the infant's tumor entirely, to provide urinary drainage, and to allow him to resume chemotherapy quickly.

## CONCLUSION

The management of this infant is an example of the advances that have been made in treating RMS. This clinical scenario, however, is not found in textbooks, and a complex disease process necessitates an innovative

approach. Our surgical plan proved to be a successful way to manage this patient with much less morbidity than more standard options. Importantly, it also afforded him the ability to resume his chemotherapy regimen more quickly, and will allow us the opportunity to offer him and his family reconstruction in the future.

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