Nephron Sparing Surgery for Unilateral Wilms Tumor in Children with Predisposing Syndromes: Single Center Experience Over 10 Years

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Purpose: Unilateral Wilms tumors associated with predisposing syndromes are treated with preoperative chemotherapy followed by surgical resection. We describe our experience with nephron sparing surgery for Wilms tumor in this population at risk for metachronous lesions.

Materials and Methods: We conducted a retrospective review of all children with a predisposing syndrome who underwent nephrectomy for malignancy during a 10-year period (2000 to 2010). Data collected included age, mode of detection, tumor size, treatment, pathology results, followup time and recurrence episodes.

Results: From 2000 to 2010, 13 of 75 (19%) patients treated for Wilms tumor were diagnosed with predisposing syndrome(s). Eight patients with unilateral tumors were treated and had a mean age at diagnosis of 27 months (range 7 months to 9 years). Beckwith-Wiedemann syndrome, isolated hemihyperplasia, WAGR (Wilms tumor, Aniridia, Genitourinary abnormalities, mental Retardation) syndrome and isolated 11p13 deletion were the underlying diagnoses in 3, 2, 2 and 1 patient, respectively. All but 2 patients were diagnosed by screening ultrasound and 5 underwent preoperative chemotherapy. Median tumor size at surgery was 2.5 cm (range 1 to 13). Nephron sparing surgery was performed in 6 of 8 patients. Pathological study showed favorable histology Wilms tumor and nephrogenic rests in 6 and 2 patients, respectively. After a mean followup of 36 months (range 6 to 72) no recurrences were documented and all children had normal creatinine levels.

Conclusions: Nephron sparing surgery appears safe for patients with unilateral Wilms tumor associated with predisposing syndrome(s), allowing for the preservation of renal function and good oncologic outcomes for the available followup time. If more studies confirm our observation, current recommendations for the surgical treatment of Wilms tumor may need to reemphasize the value of attempting nephron sparing surgery in this patient population.

Key Words: Wilms tumor, nephrectomy, child, disease susceptibility

Abbreviations and Acronyms

BWS = Beckwith-Wiedemann Syndrome
CKD = chronic kidney disease
FH = favorable histology
GFR = glomerular filtration rate
IH = isolated hemihyperplasia
NR = nephrogenic rests
NSS = nephron sparing surgery
PS = predisposing syndrome(s)
WT = Wilms tumor

Study received research ethics board approval.

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ALTHOUGH usually sporadic, Wilms tumors are described in association with predisposing syndromes in approximately 10% to 15% of cases,[1] most commonly WAGR, Denys-Drash, Beckwith-Wiedemann and IH. Affected children are at increased risk for early and multifocal (synchronous or metachronous) neoplasms. Therefore, tumor surveillance is recommended with ultrasound repeated

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every 3 months through a prescribed period of childhood, depending on the syndrome (eg WAGR—6 years old, overgrowth syndromes—8 years).[2–5]

Currently unilateral WT associated with PS is treated with a strategy that mirrors the approach followed for children with bilateral tumors or neoplasms arising in a solitary kidney. Under COG (Children's Oncology Group) protocol AREN 0534,[6] preoperative chemotherapy is provided after diagnosis (based on imaging studies or histology), followed by surgical resection.[7] This approach allows for the preservation of renal tissue at risk for metachronous tumors. However, NSS in this setting has not been widely reported or recommended.[8] Considering the current paucity of published data in pediatrics, we describe our experience with NSS for the treatment of syndromic unilateral WT. We hypothesize that this approach can be safely offered to this patient population, providing acceptable cancer control while preserving ipsilateral functional renal parenchyma in the setting of molecular predisposition for further tumor development.

MATERIALS AND METHODS

Following approval by our institution's Research Ethics Board (#1000023662), we conducted a medical record review of all children diagnosed with WT during a 10-year period (2000 to 2010) at a single institution pediatric referral center. Consecutive patients who underwent nephrectomy for malignancy were identified from these records. Only patients with a PS were included in the analysis. Although strictly considered a retrospective analysis, these children were all prospectively evaluated and data were captured in a systematic fashion upon enrollment in the appropriate contemporary treatment protocol (NWTS [National Wilms Tumor Study group] or COG). Thus, available information was complete and likely more accurate than a retrospective chart analysis as it was nested within these protocols.

The data collected included age at presentation, specific PS, mode of detection (ie screening vs triggered by symptoms or findings on physical examination), initial tumor size, administration of neoadjuvant chemotherapy, pathology results, stage, followup time, recurrence episodes (local recurrence or metastatic disease), postoperative complications, development of hypertension and renal function after surgery.

In terms of operative approach, our surgical technique mirrors steps previously reported by others.[8,9] The peritoneal cavity was entered through a chevron or transverse upper abdominal incision. After releasing the colon and opening Gerota fascia, the kidney was mobilized completely and elevated on its vascular pedicle with vessel loops. Hypothermia with surface cooling using ice slush was favored, except for cases in which the neoplasm appeared particularly amenable to a straightforward resection and short or absent warm ischemia time. Perirenal fat lying directly on top of the tumor was left intact as much as possible to ensure negative margins and decrease chances of tumor surface disruption. The lesion to be excised was identified by palpation, or by intraoperative ultrasound when nonpalpable or when there was doubt about the depth of the lesion into the parenchyma. Resection proceeded in a plane of normal appearing parenchyma (including the dissection plane commonly seen after chemotherapy with development of a pseudocapsule) to ensure negative surgical margins, which were verified by frozen section of the renal bed and specimen margins. If the collecting system was entered, it was closed with absorbable sutures and a Double-J® stent was inserted only in cases with a large degree of disruption of the calyces. The resulting defect was approximated by interrupted absorbable sutures through the renal capsule, using Surgicel® and a hemostatic agent (Tisseel® and/or FloSeal®).

RESULTS

During the study period 114 nephrectomies for malignancies were performed. Of those cases 75 (66%) had a diagnosis of WT, which was associated with a PS in 13 (13 of 75, 19% of all WT). Mean patient age at diagnosis was 27 months (range 7 months to 9 years). Six patients had bilateral tumors on presentation and were treated with neoadjuvant chemotherapy. Of these patients 1 with bilateral lesions had a complete response to chemotherapy on 1 side and, thus, was treated surgically as unilateral. There were 7 patients who presented with unilateral tumors, so overall 8 children were analyzed as having unilateral disease. None of these patients underwent pretreatment biopsy and treatment was initiated based solely on imaging findings.

The BWS, IH and WAGR syndrome were the underlying PS in 3, 2 and 2 patients, respectively. One patient had an isolated 11p13 deletion and multiple medical comorbidities but did not fit into any of diagnostic criteria for a well-known PS. Screening ultrasound was the mode of diagnosis in all but 2 patients who presented with palpable abdominal masses. The first patient was a 9-year-old with BWS who was screened per protocol with ultrasound every 3 months until 8 years old. The other patient was previously mentioned as having an isolated 11p13 deletion, and was not under a formal screening protocol. Preoperative chemotherapy was administered to 5 patients. Median tumor size at surgery was 2.5 cm (range 1 to 13).

Partial nephrectomy was attempted in 7 patients and accomplished in 6, with surface cooling after securing the renal pedicle in 3 and assisted by intraoperative ultrasound in 5. Two patients underwent radical nephrectomies, with 1 due to intraoperative findings and the other at the beginning of the study period, when no formal recommendations existed in terms of preoperative chemotherapy and NSS in the setting of unilateral tumors and predis-