Single Institution Experience with Tru-Cut Renal Mass Biopsy for Diagnosing Wilms Tumor

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Purpose: To evaluate the efficacy of needle biopsy for diagnosing Wilms tumor (WT) before chemotherapy.

Materials and Methods: We reviewed our institutional experience with Tru-Cut biopsy of pediatric renal masses in patients who subsequently underwent nephrectomy. We compared biopsy pathology with nephrectomy specimens to determine if biopsy accurately predicted final pathology.

Results: Seven children underwent Tru-Cut renal mass biopsy followed by surgical resection. In 4 patients, the final biopsy pathology was definitively read as WT and in 3 subjects, the pathology was read as WT versus hyperplastic nephrogenic rest. In all 7 patients, the nephrectomy pathology confirmed a diagnosis of WT. There were no complications after biopsy, and no patients have had local or regional recurrence.

Conclusion: In our experience, pre-therapy Tru-Cut biopsy safely provides an adequate specimen for pathologic review in diagnosing WT.

Keywords: pediatrics, Wilms tumor, nephroblastoma, kidney neoplasms, diagnosis

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INTRODUCTION

Wilms tumor (WT) is the most common renal malignancy in children and the fourth most common childhood cancer.[1-3] In North America, patients with WT are treated with protocols developed by the Children's Oncology Group (COG), which recommend primary nephrectomy for histological diagnostic confirmation followed by therapy dictated by surgical staging. A different strategy is used by the International Society of Pediatric Oncology (SIOP) protocols, which advise initial pre-operative chemotherapy, after radiographic diagnosis.

While outcomes remain excellent regardless of the utilized protocol,[4] there are concerns with each. The risk of upfront chemotherapy includes over-treating benign, non-WT renal masses as well as under-treating more aggressive tumors. However, pre-operative chemotherapy does have the advantages of decreased tumor rupture, down-staging, reducing the overall chemotherapy dose (specifically, cardiotoxic anthracyclines), and the reduced need for radiation. Furthermore, advocates of minimally-invasive surgery[5,6] and nephron-sparing surgery[7] recognize that pre-surgical chemotherapy could increase the percentage of children eligible for these approaches.

The United Kingdom Children's Cancer Study Group (UKCCSG) has recently investigated the timing of chemotherapy and nephrectomy in a study randomizing children with newly diagnosed, unilateral, and non-metastatic renal tumors to immediate nephrectomy versus 6 weeks of pre-operative chemotherapy followed by nephrectomy.[8] Their solution to giving chemotherapy without a tissue diagnosis was to offer percutaneous biopsy prior to chemotherapy. However, such a paradigm is not routinely used in North America and current COG recommendations mandate upstaging in unilateral cases undergoing biopsy.[4] Given the various risks and potential benefits, we reviewed our institutional experience with percutaneous biopsy for pediatric renal masses to evaluate its diagnostic ability and safety.

CASE REVIEW

Using institutional review board approved methods, we reviewed patients at our institution who underwent renal mass biopsy, open or percutaneous, from 1993 to 2010. We then identified those who subsequently had a definitive surgical resection of the renal mass. The biopsy and surgical resection pathologic specimens were then reviewed by study pathologist to compare and correlate the pathologic findings from the two procedures.

We identified 17 patients who underwent renal mass biopsy for tissue diagnosis; 8 had open biopsy and 9 percutaneous biopsy. All 9 percutaneous biopsies were done using an 18 gauge Tru-Cut core-needle biopsy. Of the 9 patients who underwent percutaneous biopsy, 6 were female and 3 were male, with a median age of 49.9 months (range, 6.8 to 79.8 months).

One patient had a prior liver transplant, and imaging done for elevated transaminases demonstrated a renal mass suspicious for WT. However, because of a concern for post-transplant lymphoproliferative disorder (PTLD), the patient underwent percutaneous biopsy, which confirmed the diagnosis of PTLD, saving them from un-necessary nephrectomy.[9]

Another patient had a percutaneous biopsy performed for a possible renal abscess versus tumor. After the pathology demonstrated WT, the patient underwent an uneventful nephrectomy. One additional patient with widespread metastatic disease at the time of diagnosis underwent open biopsy at the same operative session as needle biopsy due to inconclusive pathologic material from the needle biopsy. However, this patient did not undergo nephrectomy due to disease progression during the time from biopsy to planned nephrectomy. The remaining 6 patients had bilateral renal masses.

Our review focused on the 7 patients who had definitive resection after percutaneous biopsy in order to correlate the pathologic findings. In 4 patients, the biopsy pathology was definitively read as WT and in 3 subjects, the pathology was read as WT versus hyperplastic nephrogenic rests. No biopsy specimens had anaplastic features. There was a median of 5 (2 to 8) individual attempted biopsies done at each session to produce a median of 3 (2 to 6) evaluable specimens for pathologic review. In all 7 patients, the final pathology from the surgical resection confirmed the diagnosis of WT. In one subject, final pathology demonstrated diffuse anaplasia not seen in the biopsy. There were no complications during or after the biopsy and no patients have had a local or regional recurrence at a median of 58.9 months (range, 12.1 to 72.9

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months) post-biopsy.

DISCUSSION

Despite the potential advantages of pre-surgical chemotherapy for WT, the concern for inappropriately treating non-Wilms pathology hinders widespread acceptance of this paradigm. Previous investigators have studied pre-therapy biopsy, and demonstrated that approximately 10% of children with renal masses radiologically diagnosed as WT have non-WT pathology.[8,10] Therefore, they propose that a pre-therapy biopsy allows appropriate identification of candidates for pre-surgical chemotherapy.[8]

However, the concerns about a biopsy-first protocol include risks of tumor spillage and possible biopsy-tract seeding.[11,12] For these reasons, the current COG protocols mandate upstaging of cases undergoing percutaneous biopsy. Thus, despite using biopsy to achieve a goal of decreased morbidity, it would result in exposure to a higher risk of complications. To investigate this, the UKCCSG has studied a biopsy-first protocol for non-metastatic and unilateral renal masses suspected to be WT.[8,10] Their results indicate that percutaneous biopsy of such masses is safe and effective. That prompted this review of our experience with percutaneous needle biopsy of suspicious renal masses to assess both its safety and diagnostic ability.

In summary, we found percutaneous renal mass biopsy to be safe and accurate in our small series. To determine the accuracy of biopsy, we reviewed all children who had undergone percutaneous biopsy and subsequently had definitive surgical resection. In each case, the diagnosis of WT from the biopsy was confirmed by pathologic evaluation of the final resection.

The limitation seen in our review was the ability of the biopsy pathology to diagnose anaplasia. We observed one (14.2%) patient with diffuse anaplasia seen in the nephrectomy specimen, but not on biopsy. This is similar to the UKCCSG's experience, in which only 23% of WTs with anaplasia had it identified on biopsy.[10]

In terms of the safety of percutaneous renal mass biopsy, we did not observe any short or long-term complications. However, there are risks and these must be highlighted. The immediate risks include bleeding, infection, and pain. The more dreaded long-term complications are needle-tract tumor seeding or tumor spillage and increased local disease recurrence. While there have only been two reported cases in the literature of needle tract recurrence, the risk must not be ignored.[11,13] In terms of tumor rupture from biopsy, there was only one such a case in 181 patients (0.5%) in the UKCCSG study.[10] To put this into perspective, the rate of intra-operative tumor rupture in the immediate surgery arm of the same study was 15%.[8] Most importantly, in their experience, the group who underwent percutaneous biopsy and pre-surgical chemotherapy showed no increase in local recurrence or decrease in event-free or overall survival. Furthermore, they achieved a migration towards decreased stage when compared to the immediate surgery group.[8]

We should highlight that the majority of our patients were children with bilateral masses, and thus, our population may be enriched with a higher chance of the masses being WT. Furthermore, since we did not routinely biopsy all masses, we must point out the selection bias inherent in such a review that lacks a denominator. Therefore, our highly selected experience may not be applicable to a generalized population and specifically those with unilateral masses.

CONCLUSION

In our series, Tru-cut renal mass biopsy reliably and safely diagnosed WT. Using such a pre-therapy biopsy paradigm may aid in the appropriate selection of candidates for pre-surgical chemotherapy and its associated benefits. Hopefully, future co-operative group trials will consider incorporating this aim to assess its ultimate utility and safety.

CONFLICT OF INTEREST

None declared.

REFERENCES

1. Gurney JG, Severson RK, Davis S, Robison LL. Incidence of cancer in children in the United States. Sex-, race-, and 1-year age-specific rates by histologic type. Cancer. 1995;75:2186-95.
2. Grovas A, Fremgen A, Rauck A, et al. The National Cancer Data Base report on patterns of childhood cancers in the United States. Cancer. 1997;80:2321-32.

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3. Kaste SC, Dome JS, Babyn PS, et al. Wilms tumour: prognostic factors, staging, therapy and late effects. Pediatr Radiol. 2008;38:2-17.
4. Nakamura L, Ritchey M. Current management of wilms' tumor. Curr Urol Rep. 2010;11:58-65.
5. Barber TD, Wickiser JE, Wilcox DT, Baker LA. Prechemotherapy laparoscopic nephrectomy for Wilms' tumor. J Pediatr Urol. 2009;5:416-9.
6. Duarte RJ, Denes FT, Cristofani LM, Odone-Filho V, Srougi M. Further experience with laparoscopic nephrectomy for Wilms' tumour after chemotherapy. BJU Int. 2006;98:155-9.
7. Cost NG, Lubahn JD, Granberg CF, et al. Oncologic outcomes of partial versus radical nephrectomy for unilateral Wilms tumor. Pediatr Blood Cancer. 2012;58:898-904.
8. Mitchell C, Pritchard-Jones K, Shannon R, et al. Immediate nephrectomy versus preoperative chemotherapy in the management of non-metastatic Wilms' tumour: results of a randomised trial (UKW3) by the UK Children's Cancer Study Group. Eur J Cancer. 2006;42:2554-62.
9. Cheng E, Fustino N, Klesse L, Chinnakotla S, Sanghavi R. Post-transplant lymphoproliferative disorder resembling Wilms tumor. Diagnostic dilemma: renal biopsy or nephrectomy? Pediatr Transplant. 2011;15:E187-91.
10. Vujanic GM, Kelsey A, Mitchell C, Shannon RS, Gornall P. The role of biopsy in the diagnosis of renal tumors of childhood: Results of the UKCCSG Wilms tumor study 3. Med Pediatr Oncol. 2003;40:18-22.
11. Lee IS, Nguyen S, Shanberg AM. Needle tract seeding after percutaneous biopsy of Wilms tumor. J Urol. 1995;153:1074-6.
12. Shet T, Viswanathan S. The cytological diagnosis of paediatric renal tumours. J Clin Pathol. 2009;62:961-9.
13. Aslam A, Foot A, Spicer R. Needle track recurrence after biopsy of non-metastatic Wilms tumour. Pediatr Surg Int. 1996;11:416-7.

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