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# Laparoscopic nephrectomy for Wilms' tumor: Can we expand on the current SIOP criteria?

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## Summary

### Introduction
Wilms' tumor now has a good overall prognosis with open radical nephrectomy having been the mainstay of surgical treatment. Recently laparoscopic nephrectomy (LN) has been growing in popularity. The aim of our study was to review our indications and outcomes for laparoscopic resections for Wilms' tumor and compare indications with International Society of Paediatric Oncology (SIOP) criteria for LN.

### Material and methods
Patient demographics, preoperative management, surgical data, respect of SIOP criteria, complications, disease outcome, and follow-up were recorded on consecutive children who underwent nephrectomy for Wilms' tumor.

### Results and discussion
Fifty-four consecutive children with Wilms' tumor underwent a nephrectomy; 20 had a LN (Table). Nine of 20 (45%) patients who had LN did not meet SIOP criteria for LN. No patients had an intraoperative tumor rupture and one patient had positive margins because of preoperative rupture. There were two conversions: one caused by difficulty accessing the renal hilum and the other caused by difficulty maintaining oxygen saturations. There was one local recurrence.

### Conclusion
SIOP criteria are conservative and safe. Indications can be extended for teams experienced in surgical oncology and laparoscopy after agreement at a multidisciplinary meeting (MDM).

**Table** Comparison table of open versus laparoscopic nephrectomy.

| | Open nephrectomy | Laparoscopic nephrectomy |
|---|---|---|
| Total | 34 | 20 |
| SIOP criteria for laparoscopic nephrectomy met | 0 | 11 |
| Margins involved | 5 | 1 |
| Lymph nodes harvested (mean) | 4.6 | 4.8 |
| Recurrences | 5 | 1 |

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## Introduction

Outcomes for Wilms' tumors have improved in the last few decades and are now approaching 90% cure rates [1—3]. Surgery still has an important role in the treatment pathway. Complete resection with clear margins and without tumor spillage reduces the risk of local and abdominal recurrence thereby avoiding the need for doxorubicin and radiotherapy [4,5]. As a result minimally invasive surgery did not play a role in pediatric oncology surgery, and in particular in the management of Wilms' tumors, as laparoscopy was not felt to provide the same level of control and delicate handling of the tumor, leading to concern over increased tumor rupture and upstaging of the child. Recent technical innovations and evidence that neoadjuvant chemotherapy in the SIOP protocol caused tumor shrinkage and encapsulation rendering them more resistant to tumor spillage [6] have made laparoscopic nephrectomy (LN) a feasible option. Duarte and colleagues first described LN for Wilms' tumor in 2004 [7]. Subsequently, they published their long-term follow-up on 24 patients [8] and other groups around the world have followed suit with encouraging results [9—11]. There has also been reference made to the difficulty of lymph node sampling laparoscopically and this is very important for accurate staging [11].

In 2014, SIOP released the Umbrella Protocol, which offered guidance on when LN could be a suitable option, and these were also included in the 2016 Protocol (Table 1) [12,13]. These were guidelines based on the experience of groups to date and were conservative to respect the oncological principles of open surgery with avoidance of tumor spillage, that is tumors that were relatively small, with a rim of normal renal cortex around them.

LN has been performed at our institution since 2010 prior to the introduction of the SIOP guidelines. The two surgeons performing the surgeries in this series have experience in other laparoscopic tumor resections [14].The aim of our study was to review our series and outcomes for laparoscopic resections for Wilms' tumor and compare indications to SIOP criteria for LN. The hypothesis was that SIOP criteria were conservative and that the indications could be safely extended.

## Methods

### Patient criteria

We performed a retrospective review of consecutive children who underwent nephrectomy for Wilms' tumor from April 2010 to January 2017. Patients with other renal malignancies, mesoblastic nephroma, or nephrogenic rests were excluded (Fig. 1). All children with a preoperative diagnosis of Wilms' tumor and older than 6 months received neoadjuvant chemotherapy according to the current SIOP protocol. The decision to perform an open nephrectomy or LN was made at a solid tumor multidisciplinary meeting (MDM) prior to consenting the family. The MDM included oncologists, radiotherapists radiology, histopathologists, pediatric surgeons, and urologists. Patients with a tumor suitable for nephron sparing surgery (NSS) according to the SIOP protocol were excluded.

**Table 1** SIOP 2014 Umbrella Protocol criteria for laparoscopic nephrectomy.

| Indications | Contraindications |
|---|---|
| Unilateral | Tumor infiltrating extra renal structures |
| Resection must adhere to oncological principles including lymph node sampling | Tumor extending beyond the ipsilateral border of the spinal column (Fig. 2A and B) |
| Small, central tumors with a rim of "normal" renal tissue | Thrombus in renal vein or vena cava |
| If a NSS could be possible it should be preferred even if open approach is needed | Little or no experience in LN — consider transfer |

### Operative technique

LN was performed via the transperitoneal approach in a 30° lateral position, with the patient tilted to elevate the affected side. A 10-mm umbilical Hasson port was used with up to four 5-mm working ports. The colon was reflected and the renal hilum dissected to expose the vein and artery. When the mass extended beyond the ipsilateral spinous processes on the right, the duodenum was fully kocherized to give access to the hilum. In large left-sided tumors the lateral peritoneal attachments of the spleen were divided and the spleen and distal pancreas reflected medially to unveil the renal hilum. The dissection of the IVC on the right and aorta on the left started at the level of iliac vessels to follow IVC and aorta from below to the upper part above the renal vessels. The renal artery and vein were ligated with hem-o-loks (Teleflex) and ligaclips. The ureter was divided close to the bladder with ligaclips or hem-o-loks. The adrenal gland and gonadal vessels were preserved where possible. The tumor was removed in a 15-mm Endocatch bag (Covidien) through a Pfannenstiel incision. Lymph nodes were sampled from the hilar, right para-caval, left para-aortic, and inter-aortocaval regions, and distant nodes if enlarged.

### Patient data

Patient demographics, preoperative management, surgical data, respect of SIOP criteria [12,13], complications, disease outcome, and follow-up were recorded. The SIOP criteria from the umbrella protocol are listed in Table 1. These criteria are based on the CT scan done just prior to surgery after neoadjuvant chemotherapy (Fig. 2).

### Statistics

Data were analyzed using GraphPad Prism version 6. Data were assessed for normality using the Agostino-Pearson test

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