Paediatric nephrectomy: Patterns, indications and outcome in a developing country

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Abstract

Patterns of and indications for nephrectomy vary in different age groups, geographical locations and time periods. In some series nephrectomies were mainly for malignant conditions while in others they predominated for non-malignant conditions. Such data on patterns, indications, and outcomes of nephrectomy in children is limited in our environment. Objectives

To evaluate nephrectomy in childhood at the Sub-Department of Paediatric Surgery University of Nigeria Teaching Hospital, Jisik/Oualla Enugu with a focus on pattern, indications, and outcome.

Materials and Methods

Medical records of all patients aged ≤16years who had nephrectomy from January 2007 to December 2016 were studied with emphasis on age, sex, side of nephrectomy, duration of symptoms before presentation, indication for nephrectomy, in-hospital complications, length of hospital stay, in-hospital mortality. SPSS version 15 was used for data entry and analysis.

Results

There were 52 nephrectomies in 32 males and 20 females. They were for 35 malignant and 17 non-malignant conditions. Most of the malignancies were Wilms tumour (34/35) while non-malignant conditions were large multicystic dysplastic kidneys (4), renal trauma with pedicle avulsion (1), posterior urethral valve with atrophic kidney (1), duplex system nonfunctioning upper pole moiety (2). Mean age at nephrectomy was 5.10 ± 3.66 years (range 7 weeks to 16 years); 59% of the nephrectomies were on the left and 41% on the right. Mean duration of hospital stay was 31.78 ± 16.39 days (range 7-66 days). In-hospital mortality rate was 5.8%.

Conclusions

In our unit, nephrolithiasis was the main indication for paediatric nephrectomy and were the only indications in females; neglected pelvi-ureteric junction obstruction was the major non-malignant indication and occurred only in males; most nephrectomies were done in the age range of 1-5 years; nephron-sparing nephrectomy, major morbidity, re-operation are uncommon and in-hospital mortality from nephrectomy is still high at 5.8%.

Introduction

Surgical removal of the kidney in children is a major undertaking. The procedure may be for non-malignant conditions of the kidney and upper urinary tract causing poorly functioning nephreuretal units. These non-malignant conditions may include chronic destructive infections, chronic obstructive uropathy, or nephropathy and severe trauma. Nephrectomy in children may also be for malignant conditions of the kidney and adrenal glands. The major indications for nephrectomy vary in different parts of the world and in different age groups and sexes with some recording more benign conditions and others more of malignancies

Traditionally, nephrectomy is undertaken by open surgery and this is still the practice in our unit as well as other centers in Low and Middle Income Countries (LMICs). More recently, however minimally invasive laparoscopic surgical techniques have been increasingly applied for nephrectomy in High Income Countries (HICs). There has also been a growing interest in the use of nephron-sparing surgery for selected patients However, late presentation in our environment, especially for malignant diseases of the kidney, is still a daunting challenge, making such renal conserving surgeries uncommon.

Materials and Methods

This is a retrospective review of all children aged ≤16 years who had nephrectomy from January 2007 to December 2016. We requested the medical records department to permit us to have access to patients data from the theatre records and data. The medical records were reviewed and data retrieved with emphasis on age, sex, side of nephrectomy, duration of symptoms before presentation, indication for nephrectomy, post-operative complications during admission, length of hospital stay, mortality during admission. The indications were broadly classified into malignant and non-malignant conditions. Data entry and analysis were done with Statistical Package for Social Sciences (SPSS version 15.0 Chicago Illinois, USA). The results are expressed as mean ± standard deviation, ratios, percentages, charts and tables

Results

There were 52 nephrectomies (35 for malignant conditions and 17 for non-malignant conditions) carried out in 32 males and 20 females with a male to female ratio of 1.6:1. Mean age at nephrectomy was 5.1 ± 3.66 years. Mean duration of symptoms before presentation was 7.6 months (4hours–42 months). There were no bilaterally cases in malignancy. 34 of the 35 malignancies were Wilms tumors while 1 was renal rhabdomyosarcoma. The non-malignant conditions were neglected pelvi-ureteric junction obstruction with loss of renal function on intravenous urography (9), large multicystic dysplastic kidneys without function on intravenous urography (4), renal trauma with pedicle avulsion (1), posterior urethral valve with non-function of one kidney on renal scintigraphy (1), duplex system with non-functioning upper pole moiety (2). In the first five year period 27 nephrectomies were done while 25 nephrectomies were done in the second five year period. Fifty-nine percent (59%) of the nephrectomies were on the left and 41% on the right. Mean duration of hospital stay was 31.78 ± 16.39 days (range 7-66 days).

Male to Female ratio for malignancy was 0.75:1. Malignancy was an indication for all nephrectomies in females (20/35), 60% (21/35) of all malignancies and 54% (28/52) of all nephrectomies in children aged 1-5 years.

Mean follow-up duration was 25.82 ± 34.12 weeks (range 0.156 weeks). There was only 1 nephron-sparing surgery in a patient with duplex renal system and nonfunctioning upper pole moiety (1%); All others had total nephrectomy. Complications of treatment included stitch reaction (2), small bowel volvulus and bowel gangrene (1), hypertrophic scar (1). There were 3 mortalities in 2 males and 1 female were noted while on initial hospital admission (mortality rate of 5.8%); 2 with Wilms tumor died intra-operatively on the operating table and one nephrectomy obstruction died of an undetermined cause in the early postoperative period.

Table 1: Age and sex distribution of nephrectomy patients

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 year</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>5.8%</td>
</tr>
<tr>
<td>1-5 years</td>
<td>16</td>
<td>10</td>
<td>26</td>
<td>50.0%</td>
</tr>
<tr>
<td>6-10 years</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>15.4%</td>
</tr>
<tr>
<td>11-15 years</td>
<td>6</td>
<td>2</td>
<td>8</td>
<td>15.4%</td>
</tr>
<tr>
<td>Total</td>
<td>35</td>
<td>20</td>
<td>55</td>
<td>100%</td>
</tr>
</tbody>
</table>

Discussion

In this series, 67% of the nephrectomies were for malignant renal conditions and 33% for benign conditions. This was similar to findings by Bou et al in Morocco where 62.5% of the nephrectomies were for nephroblastosoma. This finding, however, is contrary to many other studies on pediatric nephrectomy from different parts of the world, where there were more benign than malignant indications recorded. From Sammon et al in USA, 73.8% of nephrectomies were for benign indications, Dazalda et al in Jordan 59%, Hammad et al in New Zealand 76%, Adamson et al in England 70.5%, Chabchoub et al in Tunisia 78.7%, Featherstone et al in London, 67.5%, Nggada et al in Nigeria 60.3%. However, in some studies on indications for nephrectomy in the adult population in both developed and Low and Medium Income Countries (LMICs) more malignances were noted as indication for nephrectomy in adults. This may be due to the higher incidence of malignacy in older patients and the higher proportion of children who present with congenital malformations10. One may not readily explain why malignancy was the major indication for nephrectomy in our pediatric population just adults in same environment. However, this may be related to absence, in this study, of key non-malignant indications like complications of vesico-ureteric reflux (VUR) and renal stone.

Table 2: Sex and indications for nephrectomy

<table>
<thead>
<tr>
<th>Indication</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wilms Tumor</td>
<td>15</td>
<td>19</td>
<td>34</td>
<td>65.5%</td>
</tr>
<tr>
<td>Renal rhabdomyosarcoma</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3.8%</td>
</tr>
<tr>
<td>Pelvi-ureteric Junction (PUG) Obstruction</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>14.4%</td>
</tr>
<tr>
<td>Multicystic Dysplastic Kidney (MCDDisease)</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>14.4%</td>
</tr>
<tr>
<td>Renal Trauma</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3.8%</td>
</tr>
<tr>
<td>Posterior Urethral valve non-function in one kidney</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3.8%</td>
</tr>
<tr>
<td>Duplex system</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>7.4%</td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
<td>36</td>
<td>68</td>
<td>100%</td>
</tr>
</tbody>
</table>

Figure 1 : Bar chart showing number of nephrectomies performed by year from January 2007 to December 2016
monitoring and possible pyeloplasty instead of presenting malformations, or who present with urinary tract infection, was observed in this study.

Since VUR is the most common benign condition in some studies, non-malignant indications were seen only in males and these were mainly for duplex renal systems. The mortalities were in two Wilms tumor patients. Though our unit is in a teaching hospital, where various renal substitution strategies, and not nephrectomy in some other studies. The laparoscopic nephrectomy learning curve: a single centre’s development of a new practice. Pediatr Surg Int. 2005; 21(9):599-603.

In our unit, nephroblastoma is the main indication for nephrectomy. The earliest literature on childhood nephrectomy offered no standardization. In many cases, surgical removal was indicated for renal tumours which had no defined role in a patient’s management. The laparoscopic nephrectomy learning curve: a single centre’s development of a new practice. Pediatr Surg Int. 2005; 21(9):599-603.


In our unit, nephroblastoma is the main indication for nephrectomy. In some series, the age distribution of patients undergoing nephrectomy was 5.1±3.7 years. In New Zealand as reported by Hammad et al. (2003; 37: 43-46). In this study, the mean age at nephrectomy was 5.8%. This is high when compared to the lower incidence of VUR and hence its associated complications of vesicoureteric reflux (VUR) were the indications for nephrectomy in some other studies.

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