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The Role of Radiotherapy in the Management of Wilms Tumor at the Marrakech University Hospital Center: Indications, Dosimetric Parameters, and Clinical Outcomes: A Retrospective Study (2019–2025)

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Abstract **Original Research Article**

Background. Wilms tumor (nephroblastoma) is the most common pediatric renal malignancy. Radiotherapy is a recognized component of multimodal management in defined subgroups, but data describing its practical implementation, dosimetry, and toxicity in resource-limited settings remain scarce. ***Objectives.*** To describe the indications, technical parameters, dosimetry, and outcomes of radiotherapy administered to children treated for nephroblastoma at a single tertiary center. ***Methods.*** We conducted a retrospective descriptive cohort study of 20 children with histologically confirmed nephroblastoma, all of whom received radiotherapy, managed at the Department of Oncology-Radiotherapy, CHU Mohammed VI, Marrakech, Morocco, between January 2019 and December 2025. Data were extracted from medical records, radiotherapy reports, and imaging archives. Sociodemographic, clinical, diagnostic, therapeutic (chemotherapy, surgery, radiotherapy), and outcome variables were analyzed descriptively (frequencies, percentages, means). ***Results.*** The cohort comprised 11 girls and 9 boys (female-to-male ratio not calculated as a formal ratio; 55% vs 45%), with a male-to-female sex ratio of 0.82. Tumors were left-sided in 16 patients (80%). SIOP stage distribution was: stage I, 3 (15%); stage II, 5 (25%); stage III, 8 (40%); stage IV, 4 (20%). Histological risk stratification showed 3 (15%) low-risk, 6 (30%) intermediate-risk, and 11 (55%) high-risk tumors. All patients received neoadjuvant chemotherapy per the GFAOP-Nephro 2005 protocol and underwent radical nephroureterectomy. All 20 patients received conventional three-dimensional conformal radiotherapy (3D-CRT) with curative intent, most commonly to the ipsilateral flank (65%). The mean total dose was 21.6 Gy (range 10.5–25.2 Gy) delivered in 7–14 fractions of 1.5–1.8 Gy, over a mean overall treatment time of 11 days. The mean interval between nephrectomy and radiotherapy initiation was approximately 40,5 days. General toxicity (irradiation-related pain) occurred in 8 patients (40%), and grade I locoregional skin/mucosal reactions occurred in 3 patients (15%). Seventeen patients (85%) achieved complete remission; two relapses and three deaths were recorded. ***Conclusion.*** In this single-center cohort with a predominance of advanced-stage, high-risk disease, radiotherapy delivered as 3D-CRT following international dose/volume recommendations was feasible, associated with predominantly mild acute toxicity, and compatible with a high complete-remission rate. These descriptive findings, generated in a resource-limited setting, require confirmation in larger, prospective, multicenter cohorts before informing practice recommendations.

Keywords: Wilms Tumor; Nephroblastoma; Radiotherapy; Pediatric Oncology; Morocco; Treatment Outcome.

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INTRODUCTION

Renal tumors account for approximately 7–8% of pediatric malignancies in children under 15 years of age, and Wilms tumor (nephroblastoma) represents the large majority of these lesions.1 Since the multimodal paradigm combining surgery, chemotherapy, and radiotherapy was established following the work of Farber in the 1950s, survival has improved substantially, and international cooperative groups principally the International Society of Pediatric Oncology (SIOP) and the Children's Oncology Group (COG) have progressively refined risk stratification, treatment

sequencing, and irradiation volumes to balance tumor control against long-term toxicity.1,2

Within this multimodal framework, radiotherapy retains a well-defined but selective role, indicated principally for advanced local stage (stage III), unfavorable histology, residual macroscopic disease, or pulmonary/hepatic metastatic involvement.1 Its dose, fractionation, and target volumes are protocol-driven, and modern conformal techniques aim to spare organs at risk particularly the contralateral kidney, liver, lungs, and spine to limit late sequelae.

Most published data on nephroblastoma radiotherapy originate from high-income countries with established pediatric radiation oncology infrastructure. Data describing the practical implementation of radiotherapy delay from surgery, target volumes actually used, dose-fractionation patterns, and toxicity in low- and middle-income settings, where diagnostic delay and advanced-stage presentation are more common, remain limited. Such settings often differ from reference cohorts in stage distribution, histological risk profile, and resource availability, all of which may affect how radiotherapy is delivered and tolerated in practice.

This gap is particularly relevant in North Africa, where prior single-center series have described nephroblastoma outcomes but with limited granularity regarding radiotherapy technique and dosimetry. A detailed, protocol-referenced description of radiotherapy practice in this context can help identify areas of concordance or divergence from international standards and inform local quality-improvement efforts.

The objective of this study was to describe the indications, technical and dosimetric characteristics, and clinical outcomes of radiotherapy administered to children treated for nephroblastoma at a single Moroccan tertiary referral center between 2019 and 2025.

METHODS

Study design and setting. This was a retrospective, descriptive, single-center cohort study conducted in the Department of Oncology-Radiotherapy of CHU Mohammed VI, Marrakech, Morocco.

Study period. January 2019 to December 2025 (7 years).

Study population. All children diagnosed with nephroblastoma and treated with radiotherapy during the study period were considered for inclusion.

- *Inclusion criteria:* clinically and radiologically suspected nephroblastoma with histological confirmation; receipt of radiotherapy as part of management.
- *Exclusion criteria:* incomplete medical or surgical records; diagnosis established outside the study period.

Twenty patients met these criteria and constituted the analytic cohort. No a priori sample-size calculation was performed; the sample represents all eligible cases identified during the study period (exhaustive/consecutive sampling).

Data sources and collection

Data were retrospectively extracted from patient medical records, radiotherapy treatment reports (dose, fractionation, volumes, positioning/verification imaging), diagnostic and follow-up imaging (ultrasound, CT), and the department's radiotherapy information system. Data collection followed a structured process: patient identification through hospital databases, systematic chart review, and cross-referencing of imaging and radiotherapy records.

Variables

Sociodemographic: sex, age at diagnosis, geographic origin (urban/rural, region), socioeconomic level, health insurance coverage, family/medical history. - *Clinical:* presenting symptoms, diagnostic delay, physical examination findings, tumor laterality. - *Diagnostic/imaging:* abdominal ultrasound and CT characteristics, chest radiography, thoraco-abdomino-pelvic CT (extension work-up). - *Staging:* local, locoregional, and distant extension; SIOP stage at diagnosis. - *Therapeutic:* neoadjuvant chemotherapy regimen (GFAOP-Nephro 2005), surgical procedure, histopathological subtype and SIOP risk group, adjuvant chemotherapy, radiotherapy indication, delay, volumes, dose, fractionation, overall treatment time, positioning/verification technique. - *Outcome:* acute toxicity (general and locoregional), tumor response, relapse, survival status at last follow-up.

Definitions

Histological risk groups (low, intermediate, high) and disease stage were defined according to SIOP criteria. Radiotherapy volumes (GTV, CTV, PTV) and organ-at-risk dose constraints followed International Commission on Radiation Units and SIOP-RTSG recommendations, as referenced in the source protocol documentation. Diagnostic delay was defined as the interval between symptom onset and definitive diagnosis.

Outcomes

The primary outcome, as defined by the study, was a descriptive characterization of radiotherapy indications, volumes, dose/fractionation, and toxicity. Secondary outcomes were complete remission rate, relapse pattern, and mortality.

Statistical analysis

Data were analyzed descriptively. Categorical variables were expressed as frequencies and percentages; continuous variables were expressed as means with ranges (minimum–maximum) or, where specified, standard deviations.

Ethical considerations.

Ethical principles were respected, patient confidentiality was ensured, and informed consent was obtained for the use of medical data for retrospective research, with authorization from competent authorities.

RESULTS

Study population and baseline characteristics.

Twenty children with histologically confirmed nephroblastoma were included. The cohort comprised 11 girls (55%) and 9 boys (45%) with a male-to-female sex ratio of 0.82. Age distribution showed a single infant aged 1 year (5%), 10 children aged 2–5 years (50%), and 9 children aged 6–10 years (45%); no patients aged 11–15 years were recorded. Regarding geographic origin, most patients originated from the Marrakech region (8 cases, reported as 40%), followed by Safi and Agadir (3 cases each, 15%), El Kalaa (2 cases, 10%), and four other regions (Beni Mellal, Azilal, Ouarzazate, Chichaoua) with 1 case each (5%). Fourteen patients (70%) belonged to a low socioeconomic stratum and 6 (30%) to a middle stratum. Health-coverage status was: RAMED (a Moroccan means-tested public health coverage scheme), 11 patients (55%); CNSS, 5 (25%); CNOPS, 2 (10%); no coverage, 2 (10%). Three patients (15%) had a documented family or personal medical history of potential relevance (paternal laryngeal cancer/maternal tuberculosis; first-degree consanguinity; a cousin with nephroblastoma); no classical predisposition syndrome (WAGR, Denys-Drash, Frasier, Beckwith-Wiedemann) was identified in any patient.

Diagnostic delay and clinical presentation.

The interval from symptom onset to diagnosis was 7–30 days in 9 patients (45%), 31–90 days in 5 (25%), 91–180 days in 5 (25%), and more than 10 months in 1 patient (5%). Abdominal distension was the most frequent presenting complaint (85%), followed by abdominal pain/general condition alteration (75%) and fever (35%). On examination, abdominal mass and distension were present in all patients (100%); other findings included palpation tenderness (75%), altered general status (75%), respiratory distress (10), hypertension (5%), and peripheral adenopathy (10%). The tumor was left-sided in 16 patients (80%) and right-sided in 4 (20%); no bilateral cases were observed.

Imaging and staging.

Abdominal ultrasound, performed in all patients, showed a well-circumscribed mass in 90%, heterogeneity in 75%, calcifications in 25%, necrotic areas in 35%, vascular thrombosis in 20%, and deep adenopathy in 10%. Contrast-enhanced CT confirmed left-sided involvement in 80% and right-sided in 20%, with solid morphology in 100%, intralesional necrosis in 75%, irregular contours in 85%, and intralesional calcifications in 20% (a co-occurring cystic component was reported in 2 patients, 10%). Chest radiography was normal in 80% and showed bilateral pulmonary nodules in 20%; thoraco-abdomino-pelvic CT identified pulmonary metastases in 20%, associated pleural effusion in 15%, local organ infiltration (mesocolon, adrenal, psoas) in 15% collectively, vascular extension (inferior vena cava/renal vein) in 35%, deep adenopathy in 30%, and peritoneal effusion in 10%. Based on the extension work-up, disease was localized in 16 patients (80%) and metastatic at diagnosis (pulmonary) in 4 (20%). SIOP stage distribution was: Stage I, 3cases (15%); Stage II, 5 cases (25%); Stage III, 8 cases (40%); Stage IV, 4 cases (20%).



Figure 1: Axial CT image demonstrating a large right renal mass (arrow) consistent with Wilms tumor (nephroblastoma), causing significant enlargement of the right kidney with distortion of the normal renal architecture

Chemotherapy and surgery.

All patients received neoadjuvant chemotherapy per the GFAOP-Nephro 2005 protocol: a two-drug regimen (vincristine–actinomycin D) for localized disease (16 patients, 80%) and a three-drug regimen with the addition of an anthracycline for metastatic disease (4 patients, 20%). One episode of febrile neutropenia was recorded as a chemotherapy-related complication. Radiological response assessment after induction chemotherapy showed tumor volume reduction in 15 patients (75%), stabilization in 4 (20%), and progression in 1 (5%). The interval between the last chemotherapy cycle and surgery ranged from 8 to 30 days (mean 12 days). All patients underwent radical transperitoneal nephroureterectomy; intraoperative tumor rupture occurred in 1 patient (5%) and macroscopic residual disease in 3 (15%). Surgical exploration identified upper-pole involvement in 11 patients (55%), lower-pole involvement in 5 (25%), and extensive/whole-kidney involvement in 4 (20%); adhesions to adjacent structures were noted in 3 patients (15%).

Histopathology and risk stratification.

Histological confirmation of nephroblastoma was obtained in all 20 patients. Risk-group distribution was: low risk (completely necrotic tumor) 3 patients (15%); intermediate risk 6 patients (30%) (mixed type, 4 patients [20%]; regressive type, 2 patients [10%]) ; high risk 11 patients (55%) (blastemal-predominant type, 8 patients [40.8%]; diffuse anaplasia, 3 patients [15%]).

Adjuvant chemotherapy.

Adjuvant chemotherapy was administered according to risk group: low risk (n=3, 15%) received vincristine–doxorubicin over 9 weeks; intermediate risk (n=6, 30%) received vincristine–actinomycin D–doxorubicin over 27 weeks; high risk (n=11, 55%) received cyclophosphamide–doxorubicin–etoposide–carboplatin over 34 weeks. Hematologic toxicity (anemia, thrombocytopenia, marrow aplasia) and infectious complications were the most frequently reported adverse events.

Radiotherapy: indications, technique, and dosimetry.

All 20 patients received curative-intent conventional 3D-CRT, following ESTRO recommendations, with photon energies of 4–6 MV. The mean interval between nephrectomy and radiotherapy initiation was approximately 40,5 days (range 20–90 days). Reported indications included stage II high-risk histology (5 patients, 25%), stage III intermediate-risk histology (6 patients, 30%), stage III high-risk histology (2 patients, 10%), pulmonary metastases (7 patients, 35%), local relapse (1 patient, 5%), and metastatic (pulmonary) relapse (1 patients, 5%) . Irradiated volumes were the ipsilateral flank in 13 patients (65%), whole lungs in 2 (10%), lungs plus flank in 4 (20%), and whole abdomen in 1 (5%). Total doses ranged from 10.5 to 25.2 Gy, delivered in 7–14 fractions of 1.5–1.8 Gy per fraction, 5 days per week (mean total dose 21.6 Gy). Fraction size was 1.8 Gy in 14 patients (70%) and 1.5 Gy in 6 patients (30%, mainly those irradiated for pulmonary metastases). Overall treatment time ranged from 7 to 14 days (mean 11 days). Patient positioning was verified by portal imaging on the first two treatment days and weekly thereafter; immobilization used vacuum-molded cradles with knee/foot supports and, where required, sedation.

Radiotherapy toxicity.

General complications, principally irradiation-related pain, occurred in 8 patients (40%). Locoregional complications occurred in 3 patients (15%): grade I acute radiodermatitis in 2 patients and grade I acute radiomucositis in 1 patient. No grade ≥2 acute toxicity or treatment interruption was reported.

Outcomes.

Seventeen of 20 patients (85%) achieved complete remission. Three relapses were recorded: (1) a local/systemic relapse 9 months after completion of initial treatment, managed with chemotherapy, tumorectomy, and consolidative radiotherapy, resulting in complete remission; a late pulmonary relapse treated with chemotherapy and radiotherapy, with no therapeutic response and subsequent death; (3) a relapse at the nephrectomy site, managed with repeat surgery (8 months after the first operation), radiotherapy, and chemotherapy, resulting in complete remission. Three deaths were recorded overall: two related to uncontrolled pulmonary metastatic progression in patients with initial stage III, high-malignancy histology, and one related to a late pulmonary relapse in a patient initially classified as stage I. No patients were lost to follow-up or discontinued treatment.

Table 1: Indications for Radiotherapy (n = 20)

Indications for radiotherapy	Number of patients	Percentage
Stage II high risk	5	25%
Stage III intermediate risk	6	30%
Stage III high risk	2	10%
Pulmonary metastasis	7	35%
Local relapse	1	5%
Metastatic relapse (lungs)	1	5%

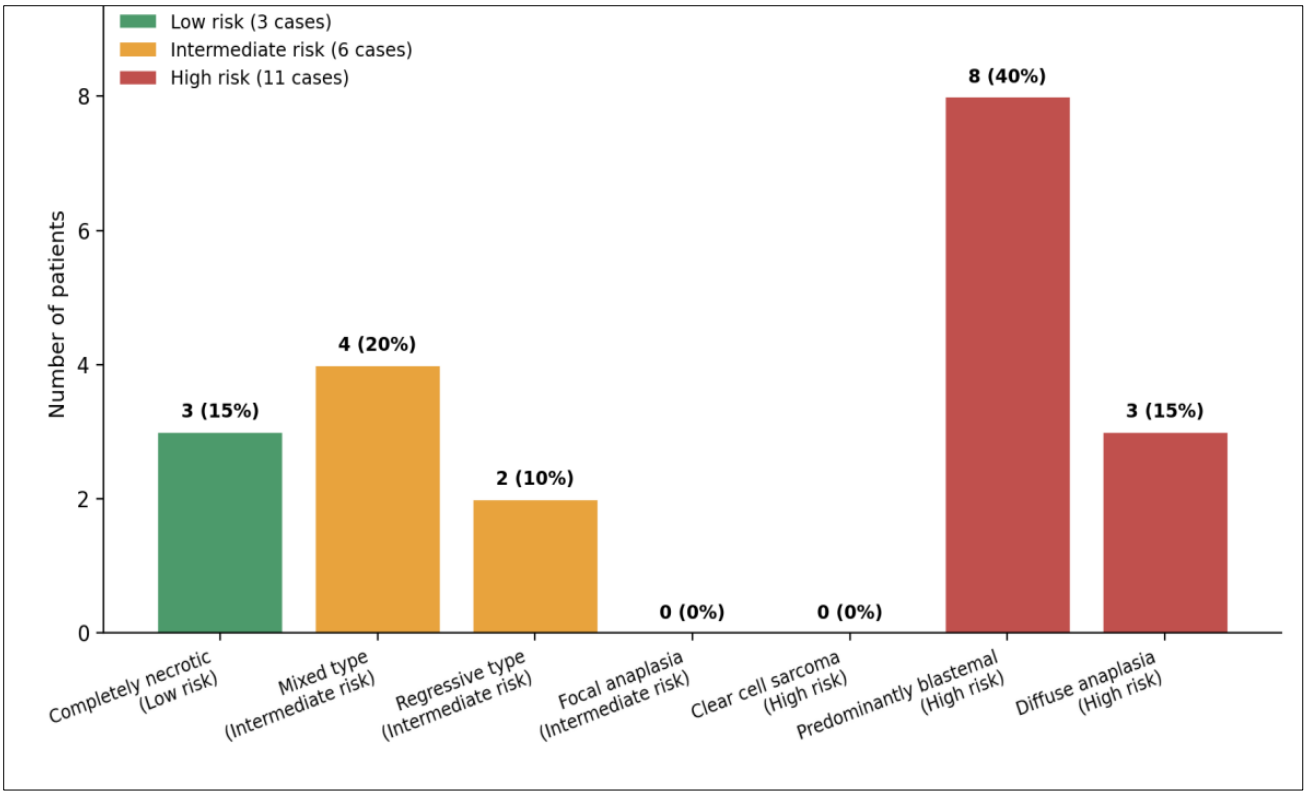


Figure 1: Distribution by histological subtype and risk groupe

Table 2: Distribution of patients according to Radiotherapy Site, Dose, Fractionation, and Overall Treatment Time

N° of patients	Irradiated site	Total dose	Fractionation (Gy/fraction)	Overall treatment time (days)
2	Renal fossa	25.2 Gy	1.8	14
6	Renal fossa	21.6 Gy	1.8	12
4	Renal fossa + lung	19.8 Gy + pulmonary irradiation 15 Gy	1.8	11
3	Renal fossa	15 Gy	1.5	10
2	Lung only	15 Gy	1.5	10
2	Renal fossa	14.4 Gy	1.8	8
1	Whole abdomen	10.5 Gy	1.5	7

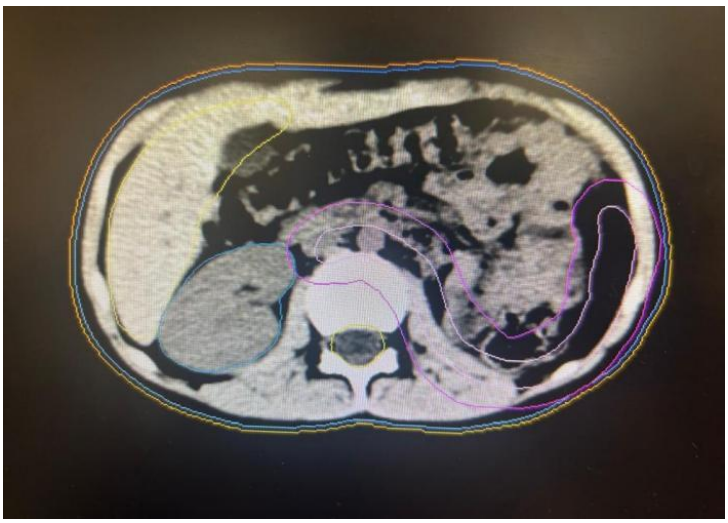


Figure 2. Axial CT slice illustrating target volume and organ-at-risk delineation for adjuvant flank radiotherapy following nephrectomy for Wilms tumor. The left renal fossa/tumor bed (clinical target volume) is contoured in pink.

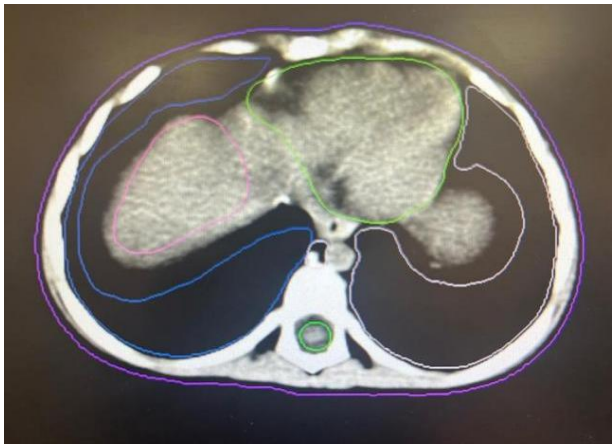


Figure 3: Axial CT slice illustrating bilateral lung contouring for whole-lung radiotherapy in metastatic Wilms tumor

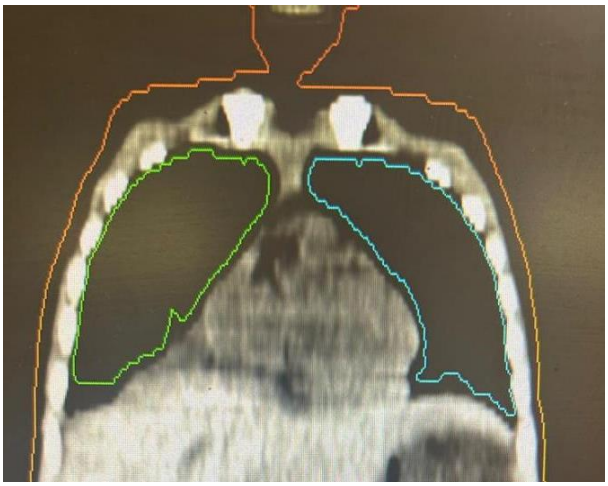


Figure 4: Coronal CT slice illustrating bilateral lung contouring for whole-lung radiotherapy in metastatic Wilms tumor

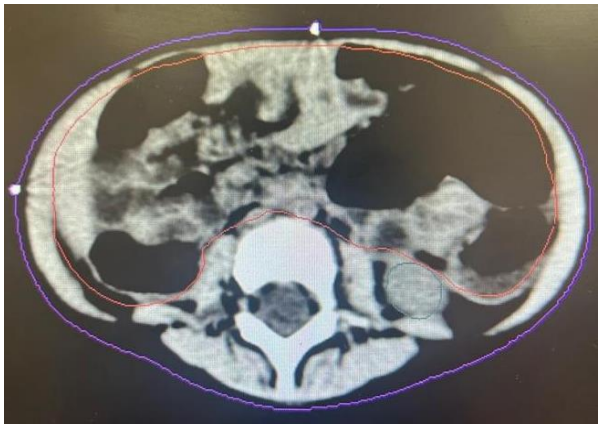


Figure 5: Axial CT slice illustrating target volume delineation for whole-abdomen radiotherapy (irradiation in toto) following tumor rupture

DISCUSSION

Principal findings

In this retrospective series of 20 children treated for nephroblastoma at a single Moroccan tertiary center, radiotherapy was delivered as curative-intent conventional 3D-CRT in all patients, most commonly to the ipsilateral flank, at a mean total dose of 21.6 Gy over a mean overall treatment time of 11 days. Acute toxicity was predominantly mild, and 80% of patients achieved complete remission despite a disease profile weighted toward advanced stage (60% stage III–IV) and high-risk histology (55%).

Role and indications of radiotherapy

Radiotherapy remains an important component of the multimodal management of nephroblastoma, particularly in locally advanced or metastatic forms. Historically, it was used almost systematically in the treatment of this tumor, but its indication has been progressively narrowed over the past decades thanks to

improvements in chemotherapy protocols and better prognostic stratification.

In our study, all patients received radiotherapy, mainly for advanced stages or high-risk forms, with the main indications being high-risk stage II, intermediate- or high-risk stage III disease, as well as the presence of pulmonary metastases or relapse. These indications are broadly consistent with international recommendations. According to the SIOP-RTSG and COG protocols, radiotherapy is mainly indicated in stage III disease and in certain high-risk stage II forms, as well as in metastatic forms requiring pulmonary irradiation. The SIOP 2001 trial recommends radiotherapy primarily for stage III disease (positive lymph nodes, tumor rupture, microscopic residual disease), unfavorable histological subtypes such as blastemal-type tumors, and pulmonary metastases persisting after chemotherapy. Similarly, National Wilms Tumor Study (NWTS) and Children's Oncology Group (COG) data have shown that radiotherapy improves locoregional control in advanced disease.

The two major cooperative frameworks differ somewhat in approach. Under SIOP, radiotherapy is reserved for locally advanced disease (intraoperative tumor rupture, positive margins, lymph node involvement) or high-/intermediate-risk histologies; preoperative RT was used in the early SIOP-1 and SIOP-2 trials but was subsequently shown to offer no advantage over chemotherapy while adding toxicity. Under the COG/NWTS approach, postoperative radiotherapy is applied systematically for stages III and IV and for unfavorable histologies (diffuse anaplasia, clear cell sarcoma, rhabdoid tumor).

Over time, the overall use of radiotherapy in nephroblastoma has declined considerably as risk stratification has improved: the earliest SIOP trials irradiated almost all patients, whereas contemporary protocols restrict radiotherapy to roughly 20–25% of cases. The SIOP 93-01 trial, for example, demonstrated that radiotherapy could be safely omitted in stage I disease with intermediate-risk histology provided adequate chemotherapy was maintained, without compromising survival. Likewise, the proportion of NWTS patients receiving radiotherapy fell from close to 70% in early studies to a markedly lower proportion in recent protocols, reflecting more selective patient identification.

Radiation volumes, dose, and fractionation

Consistent with SIOP-RTSG recommendations, radiotherapy in our cohort was directed mainly at the flank/renal fossa (85% of patients), with whole-abdomen irradiation reserved for the single patient with tumor rupture an approach validated by the SIOP-9 trial, which showed that flank irradiation is sufficient in the absence of rupture or major peritoneal contamination and meaningfully reduces long-term toxicity.

Reported total doses in our series ranged from 14.4 Gy to 25.2 Gy, broadly in keeping with international recommendations. The COG generally administers flank radiotherapy at doses of 10.8–19.8 Gy depending on stage and histological risk, while SIOP protocols allow doses up to 25.2 Gy in high-risk situations such as tumor rupture or nodal involvement. The dose/fractionation schedules and treatment volumes used in this cohort are therefore broadly consistent with SIOP-RTSG guidance for flank and whole-abdomen irradiation.

Timing of radiotherapy initiation

The interval between surgery and initiation of radiotherapy is increasingly recognized as a critical determinant of outcome. In our series this interval ranged from 20 to 90 days, with a mean of 40.5 days which is longer than the intervals recommended in the literature. COG guidelines stipulate that adjuvant radiotherapy should ideally begin within 9 days, and strictly before day 14 after nephrectomy. A recent systematic review (Odei *et al.,* 2018) showed that a surgery-to-RT interval exceeding two weeks was associated with an increased rate of local relapse and roughly doubled the risk of mortality (HR 2.13), with each additional day of delay beyond the optimal window associated with a 4% relative increase in the risk of death. For stage IV disease, SIOP recommends bilateral pulmonary irradiation only in patients whose pulmonary nodules fail to achieve complete response to chemotherapy by week 10, whereas COG has historically irradiated all metastatic lung fields, though the trend is now shifting toward omitting RT in rapid responders.

Toxicity

Acute toxicity in our cohort was predominantly mild, with pain reported in 40% of patients and grade I locoregional complications in 15%, consistent with expectations for conformal, moderate-dose pediatric abdominal irradiation and with the generally favorable acute tolerance profile reported in the literature when modern techniques are used. Late effects, however, remain an important concern in long-term survivors, with several studies describing an increased risk of growth disturbance, renal impairment, and secondary malignancy after irradiation. This concern underlies the ongoing trend toward restricting radiotherapy to situations of clearly demonstrated benefit, and toward replacing classic anteroposterior fields with highly conformal techniques (IMRT, VMAT) that reduce dose to organs at risk while adequately covering the planning target volume.

Outcomes

Despite a disease profile weighted toward advanced-stage disease (60% stage III–IV) and high-risk histology (55%), 85% of patients in this series achieved complete remission following multimodal treatment including radiotherapy. This favorable response is noteworthy in view of the substantial proportion of

patients requiring irradiation for advanced local disease, high-risk histology, or pulmonary metastatic involvement. In the SIOP-WT-2001 experience, postoperative flank radiotherapy in stage III disease was associated with excellent locoregional control, with a 5-year locoregional control rate of approximately 96–97%, supporting the role of appropriately targeted postoperative irradiation in achieving durable local disease control.

The complete remission rate observed in our series may therefore reflect effective local and metastatic disease control within a multimodal treatment strategy. However, because all patients in our cohort received radiotherapy and there was no non-irradiated comparison group, the specific contribution of radiotherapy to the observed remission rate cannot be determined. Notably, this favorable outcome was achieved despite a mean surgery-to-RT interval exceeding the 14-day threshold associated with doubled mortality risk in large cohort studies such as that of Odei *et al.,* This discordance suggests that effective systemic chemotherapy may have exerted a protective effect against local recurrence during the waiting period before radiotherapy, partially offsetting the delay.

These findings suggest that curative-intent 3D-CRT can be implemented according to international dose/volume recommendations in a resource-limited setting, with an acute toxicity profile that appears manageable. The 85% complete remission rate, achieved despite an unfavorable stage/histology distribution, is compatible with but cannot be directly equated to outcomes from larger reference cohorts, given the absence of comparative statistical analysis, a control group, and defined follow-up duration in this study. Taken together with the delayed surgery-to-RT interval observed, our results also underscore that logistical constraints affecting timing of treatment do not necessarily preclude satisfactory short-term outcomes, though they likely remain a target for improvement.

Strengths

The study benefits from a well-defined, protocol-referenced treatment pathway (GFAOP-Nephro 2005 chemotherapy, standardized surgical technique, SIOP-based histological risk stratification, and ESTRO-referenced radiotherapy planning), granular dosimetric reporting (volumes, doses, fractionation, overall treatment time, organ-at-risk considerations) that is often lacking in similar regional series, and a relatively long recruitment window (7 years) for a single-center pediatric tumor cohort.

Limitations

This study has substantial limitations that must be explicitly acknowledged. First, the sample size (n=20) is small, limiting statistical power and generalizability. Second, the retrospective, single-center design is susceptible to selection and information bias, and precludes causal inference. Third, no control or comparator group exists, so the specific contribution of radiotherapy to the observed outcomes cannot be isolated from that of surgery and chemotherapy. The study is also retrospective in nature, with a relatively small sample size and limitations in long-term follow-up in some patients. These limitations mean the study should be regarded as hypothesis-generating and descriptive rather than confirmatory.

Implications

This series provides a benchmark description of nephroblastoma radiotherapy practice in a Moroccan tertiary center that may be useful for regional quality-improvement efforts and for informing the design of larger, prospective, multicenter studies ideally incorporating standardized follow-up, survival analysis, and systematic late-toxicity assessment to more robustly characterize the role of radiotherapy in this population. In particular, our findings argue for renewed efforts to shorten the interval between surgery and radiotherapy initiation, and for greater continuity between the surgical and radiotherapeutic steps of care, in order to move closer to internationally recommended timelines.

CONCLUSION

Overall, our results confirm that radiotherapy retains an important place in the management of advanced nephroblastoma, but its use should be carefully selected according to tumor stage, histological characteristics, and response to initial treatment, so as to achieve optimal tumor control while limiting long-term toxicity. Optimizing clinical outcomes in settings such as ours will depend in large part on reducing treatment intervals: greater fluidity between the surgical and radiotherapeutic steps is essential to move closer to the standards of early treatment initiation recommended internationally.

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