CASE REPORT

A Bladder Sparing Approach in a Case of Prostate Rhabdomyosarcoma with Bladder Extension in a One-year Old Male

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Introduction

Rhabdomyosarcoma (RMS) is a malignant neoplasm of the skeletal muscle. Skeletal muscles can be found in all parts of the human body and thus such type of tumor occurs in almost any part of the body.[1] In the pediatrics. It is the most common soft tissue sarcoma and the third most common solid tumor among pediatric patients. In report in the United States, on 350 cases, 15 to 20 percent of this type of tumor were found in the genitourinary system, and only 5 to 10 percent were found in the bladder and prostate.[2] With the advent of multimodality treatment approach, patients with RMS of the bladder/prostate had a significant improvement in terms of survival over the past 30 years.

This report presents a treatment strategy in which an initial unresectable tumor was managed with neoadjuvant chemotherapy followed by organ preservation surgery. This is the first reported case at this institution of a one year old who had prostate rhabdomyosarcoma with bladder extension treated with neoadjuvant chemotherapy followed by bladder preservation surgery.

The study aimed to report a case of prostate rhabdomyosarcoma with bladder invasion in a pediatric patient, and describe the management approach, bladder preservation, and follow-up.

The Case

This is a case of a 14-month old male with prostate rhabdomyosarcoma extending into the bladder, and who presented with weak urinary stream, and decreasing urine output for 6 months. No gross hematuria was noted. Consult was done and abdominal ultrasound was requested which revealed a right pelvic mass, measuring 5.00cm x 3.93cm x 6.53cm compressing the urinary bladder; no hydronephrosis noted on both kidneys. He was then referred to a Pediatric Urologist who requested for a non-contrast abdominal Magnetic Resonance Imaging which showed a solid mass in the pelvic region (Figure 1), posteroinferior to the urinary bladder, likely involving the prostate gland measuring about 4.8cm x 4.0cm x 4.2cm. It also showed, an intravesical component in the inferior aspect of the urinary bladder (Figure 2), measuring about 3.2cm x 2.5cm x 4.0cm. It was deemed to be unresectable. Ultrasound guided suprapubic percutaneous needle biopsy of the bladder mass was done which revealed Rhabdomyosarcoma, botryoid type involving the prostate and bladder.

Bone and chest CT scans for metastatic work up were unremarkable. Patient was then referred to the Medical Oncology service for neoadjuvant chemotherapy.

The patient eventually underwent neoadjuvant chemotherapy with 3 cycles of dactinomycin, vincristine and cyclophosphamide, followed by 3 cycles of doxorubicin, vincristine and cyclophosphamide. One-month post 6 cycles chemotherapy, whole abdominal CT scan with contrast showed, interval decrease in size of the bladder tumor, measuring 2.70cm x 3.19cm x 3.03cm. Patient underwent radical prostatectomy, bladder tumor resection with vesicourethral anastomosis and pelvic lymph node dissection, bilateral. Final histopathology results revealed evidence supporting the diagnosis of rhabdomyosarcoma embryonal type (T2AN0M0; Clinical Stage 2; Clinical Group III; Clinical Risk Group: Intermediate risk).

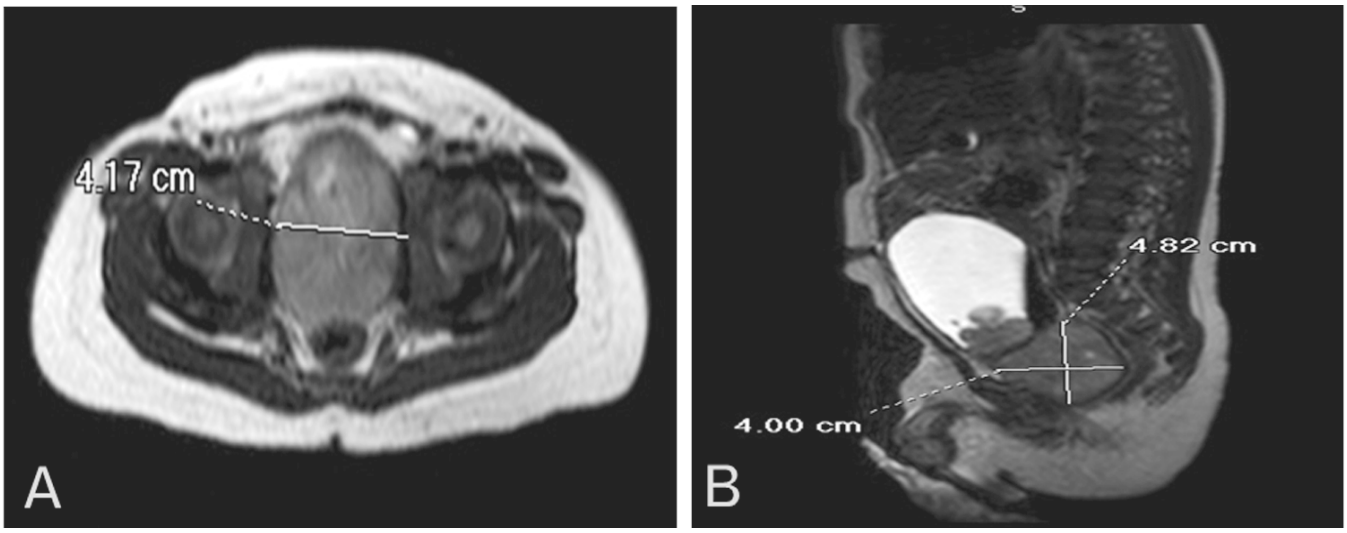

Figure 1. Non-contrast abdominal MRI. A (Transverse view) & B (Sagittal view). Predominantly solid mass in the pelvic region, likely involving the prostate gland and anterior to the rectum, measuring about 4.8cm x 4.0cm x 4.2cm.

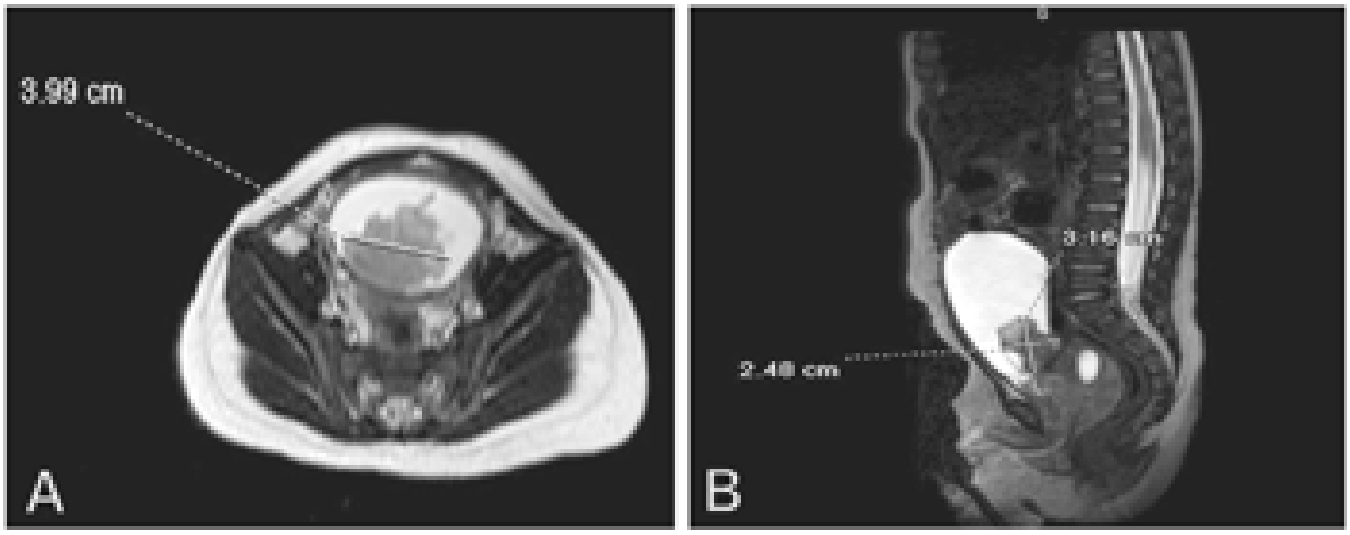

Figure 2. Non-contrast abdominal MRI. A (Transverse view) & B (Sagittal view). Intravesical component, in the inferior aspect of the urinary bladder, measuring about 3.2cm x 2.5cm x 4.0cm.

Pathologic Findings

I. Gross examination
   a. Prostate (Figure 3A & 3B) - dull to shaggy, 4.5 gram, measuring 3.8cm x2.2cm x 1.2cm
   b. Bladder tumor (Figure 3C) - cream white to tan, firm, irregular, soft tissue fragments with aggregate measurement of 1.4cm x 1.2cm x 1.4cm
   c. Pelvic Lymph nodes, bilateral (Figure 3C) - cream tan to dark brown, firm, irregular tissue fragments.

II. Histopathology
   a. Embryonal rhabdomyosarcoma, botryoid type involving the prostate and bladder with focal pleomorphic tumor present (Figure 4A)
   b. All lymph nodes isolated were negative for tumor
   c. Lines of resection negative for tumor

III. Immunohistochemical staining
   a. Positive staining: Myogenin (Figure 5A), Desmin (Figure 5B) and Sarcomeric Actin (Figure C)
   b. Negative staining: LCA (Figure 5D)

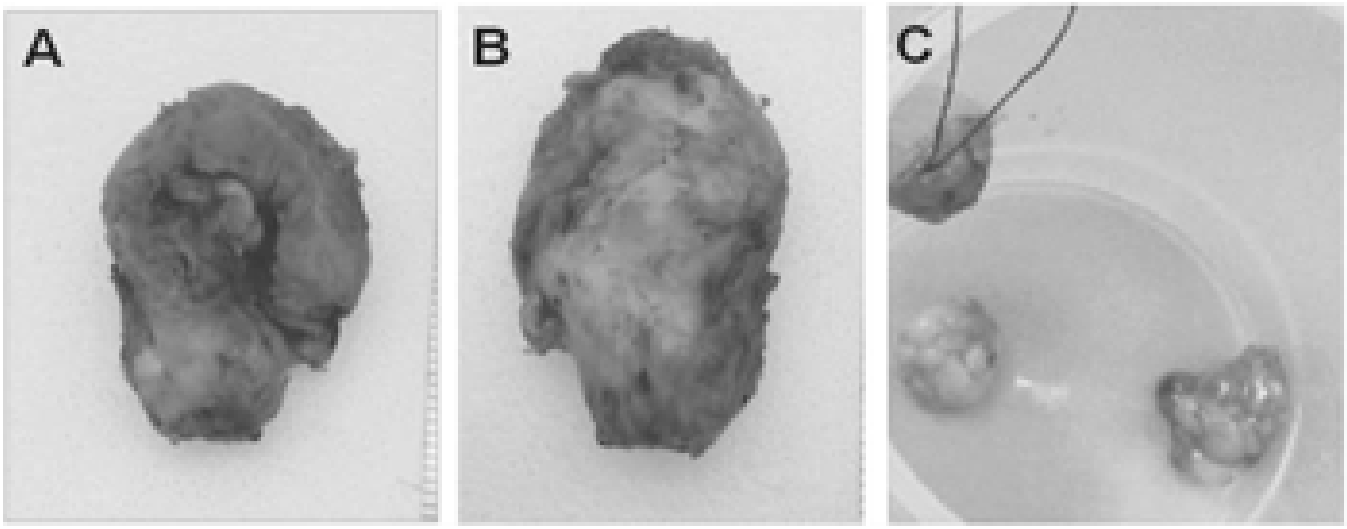

Figure 3. A and B. Prostate. C. Bladder tumor with pelvic lymph nodes, bilateral.

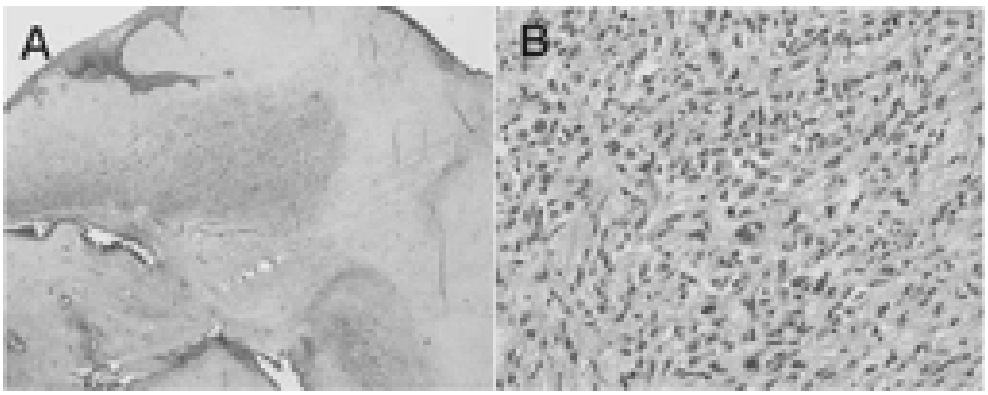

Figure 4. Histopathology. A (Bladder). Nicholson's cambium layer, a hypercellular layer beneath the epithelium indicative of embryonal rhabdomyosarcoma, botryoid type. B (Prostate). Rhabdomyoblasts with round and spindle-shaped cells.

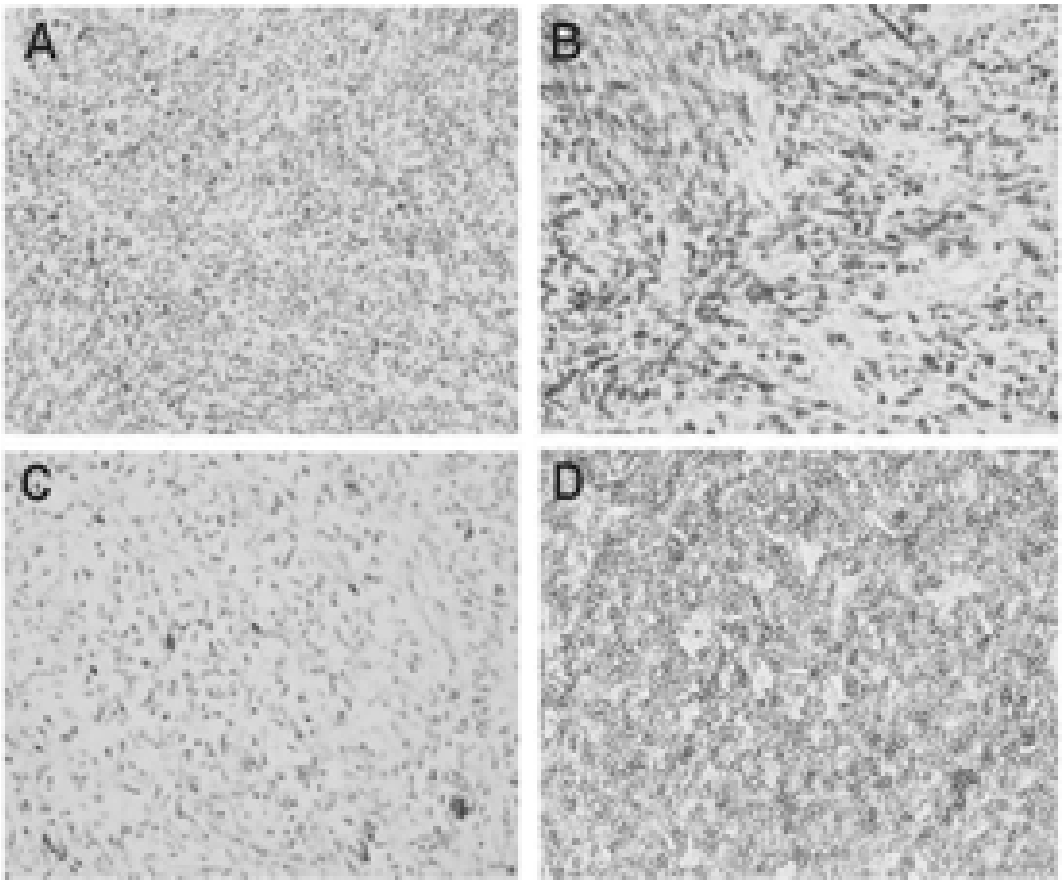

Figure 5. Immunohistochemical staining. A. Myogenin. B. Desmin. C. Actin. D. LCA.

Post-operative days were generally unremarkable. Patient was initially maintained on Foley catheter for 1 month, and which was subsequently removed. He was able to void freely. 5 months after surgery, patient had 3 cycles of adjuvant chemotherapy (doxorubicin, vincristine and cyclophosphamide). The patient had regular follow up with biannual CT scan and ultrasound, which showed no gross tumor recurrence within the bladder. Patient then became asymptomatic without voiding complaints. 2 years' post-operation, a repeat CT scan showed no radiologic evidence of tumor recurrence. A summary of patient's demographics is presented in Table 1.

Table 1. Patient's demographics.

Patients age at diagnosis (Months)	14
Sex	Male
Tumor origin	Prostate with Bladder extension
Tumor size (cm)	6cm
Histology	Embryonal Rhabdomyosarcoma
TNM stage	T2N0M0
IRS group	III
Initial biopsy	Ultrasound guided suprapubic percutaneous needle biopsy of bladder mass
Chemotherapy	Dactinomycin Doxorubicin, Vincristine Cyclophosphamide
Response to induction chemotherapy	Partial response
Primary surgery	Radical Prostatectomy, bladder tumor resection with vesicourethral anastomosis and Pelvic Lymph Node Dissection, bilateral
Radiotherapy	None
Follow up	48 months
Outcome	Recovered, no morbidity

Discussion

Rhabdomyosarcoma is the most common soft tissue tumor in children, where 15% to 20% arise from the genitourinary tract. The RMS histologic

classification system, which was originally developed by Horn and Enterline (1958), included four subtypes: embryonal, alveolar, pleomorphic, and undifferentiated. Recognition that pleomorphic tumors were anaplastic variants of embryonal RMS or alveolar RMS led to consolidation of the original system into the three histologic categories being used today: embryonal, alveolar, and undifferentiated. Embryonal RM is the most common form and the predominant histologic type found in the bladder.[3] Clinical presentations are variable and depend on the anatomic site of the tumor. In cases of bladder or prostate involvement, the initial presentation commonly includes urinary obstruction, urinary retention, urgency, frequency, and incontinence. Gross or microscopic hematuria occurs when the tumor breaks through the mucosal layer. Initial evaluation involves history and physical examination. Ultrasonography is recommended for initial assessment; however, MRI is considered the diagnostic modality of choice. The treatment in cases of bladder/prostate rhabdomyosarcoma is now improving, with the advent of organ preservation strategies and multimodal approach by the use of chemotherapy, radiation, and surgery; therefore, improving the quality of life of those patients harboring such disease.[1,2]

Formed in 1972, the Intergroup Rhabdomyosarcoma Study (IRS). Group was adopted by the Children's Oncology Group (COG) (Table 2). The COG formed a classification guide for patients with RMS based on different multicenter randomized trials in order to optimize oncologic outcome and minimize treatment related side effects. The classification includes tumor size, site and extent of involvement, intraoperative findings, and pathologic finding on biopsy (Table 3).[4] Risk stratification using this classification has been shown to predict the oncologic outcome of the patient (Table 4). The patient is staged $T_{2A}N_0M_0$; Clinical stage 2; Clinical group III; Clinical risk group: intermediate risk (Bladder and Prostate RMS cannot be delegated as stage 1 tumors).

Table 2. IRS clinical groups and pretreatment staging.

Group		Description
I		Completely resected, no evidence of metastatic disease
II	a	Microscopic residual disease after complete gross resection
	b	No residual disease, Positive lymph nodes?
	c	Positive Lymph nodes with microscopic residual disease?
III		Gross residual disease (includes biopsy)?
IV		Distant metastases

Table 3. Pre-treatment staging.

Group	Description
1	Orbit, head, and neck (except parameningeal), GU sites other than bladder and prostate, biliary tract; any size or nodal status, no metastases
2	All other sites, less than or equal to 5 cm no nodal involvement or metastases?
3	All other sites, less than or equal to 5 cm with nodal involvement or 45 cm with any nodal status, no metastases
4	Metastatic disease

Table 4. Rhabdomyosarcoma risk stratification.

Histology	Clinical Group	Stage	Age Risk	Group
Embryonal, with variants	I, II, III	1	All	Low
Embryonal, with variants	I,II	2,3	All	Low
Embryonal, with variants	III	2,3	All	Intermediate
Embryonal, with variants	IV	4	<10 yr	Intermediate
Embryonal, with variants	IV	4	<10 yr	High
Alveolar	I, II, III	1,2,3	All	Intermediate
Alveolar	IV	4	All	High

The current treatment in patients with rhabdomyosarcoma of the bladder/prostate has now been increasingly directed into a multimodal approach, compared to previous radical surgeries. Organ preservation surgery is now being studied and multiple collaboration groups have conducted studies regarding the quality-of-life (QOL) measures, outcome, and survival of patients treated with such an approach. In one study by Emir, et al. (2016), 8 patients, ages 1 to 14 years old, with embryonal RMS of the bladder/prostate were subjected to induction chemotherapy and monitored for tumor response, with subsequent tumor resection upon completion of chemotherapy. Patients were monitored during close follow-up and treated, in cases of tumor relapse, using either chemotherapy radiotherapy or surgery. Six out of the eight patients survived.[5]

In a study done by Merguerian, et al., 13 patients with lower urinary tract RMS were initially treated with induction chemotherapy followed by surgical excision and reconstruction without radiotherapy. The study concluded that the proposed treatment had a high cure rate without the late sequelae of pelvic radiotherapy which suggests reserving radiotherapy for residual and metastatic disease and for patients with unresectable disease.[6]

Arndt, et al. reviewed bladder function retention with a bladder preservation approach in patients with non-metastatic prostate/bladder RMS. Ninety patients were included in the review in which bladder preservation without relapse was achieved in 55 patients, 40% had normal bladder function defined as lack of incontinence, dribbling, hydronephrosis, or enuresis after age 10 years at a median follow-up of 9 years.[7]

In thus case, the patient was initially treated with chemotherapy, observed for tumor response, then underwent organ preservation surgery (Radical prostatectomy, bladder tumor resection with vesicourethral anastomosis and pelvic lymph node dissection, bilateral) with adjuvant chemotherapy. Currently, patient is already on a 2-year follow-up with no tumor recurrence nor voiding symptoms.

Known prognostic markers were also studied to indicate a worse prognosis in terms of overall survival and failure free survival. They included histology: non-embryonal; tumor invasion and size > 5cm, age and site of tumors. Some of these markers were also found in the patient including the age, site and size of the tumors. The presented treatment modality was able to improve the survival and quality of life of the patient. The patient had no tumor recurrence to date, based on recent diagnostic examinations (Figures 6 & 7).

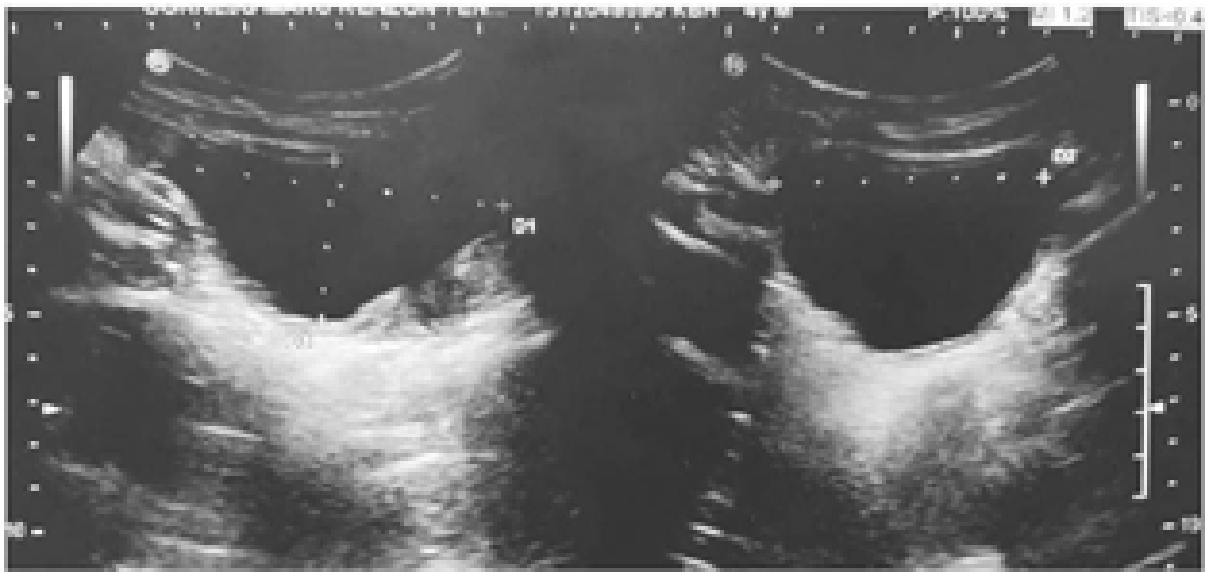

Figure 6. Bladder ultrasound (November 2016). No gross lesions noted on the urinary bladder.

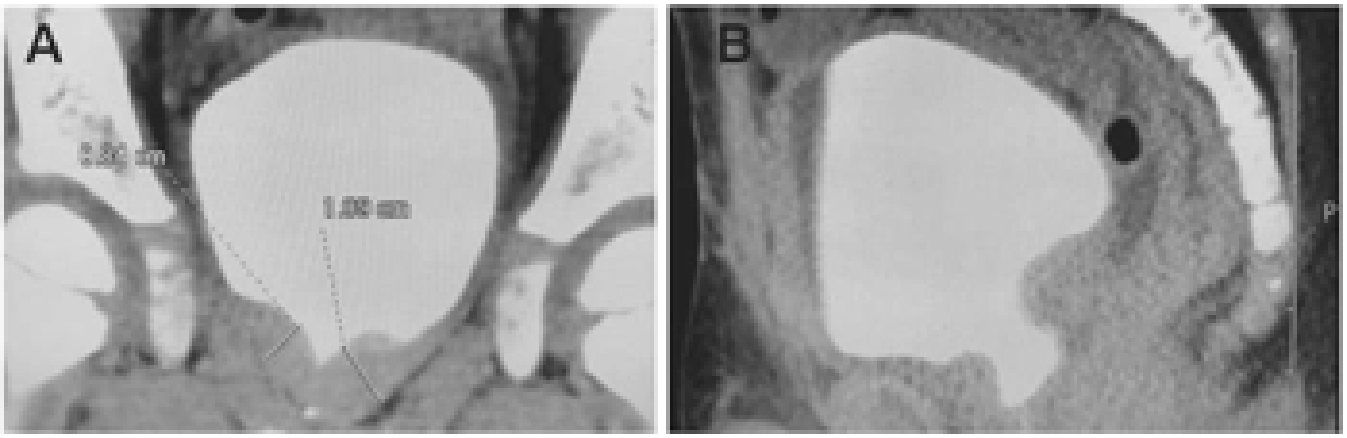

Figure 7. Bladder CT with contrast (November 2016). A (Coronal view) & B (Sagittal view). Showing no gross lesions noted on the urinary bladder.

Conclusion

Bladder or prostate rhabdomyosarcoma is a rare disease usually presenting in pediatric patients. Once diagnosis is confirmed, risk stratification and preoperative staging can be done to assess different treatment options. It is now possible not just to eradicate the tumor to improve survival but also to maintain quality of life. This treatment approach requires proper assessment and cooperation of different subspecialties (i.e. Surgery, Pediatrics and Oncology) to give the best option and to decrease complications and morbidities in patients with such tumor.

Abbreviation

RMS - Rhabdomyosarcoma; CT scan - Computed Tomography; MRI - Magnetic Resonance Imaging; IRS - Intergroup Rhabdomyosarcoma Study Group; COG, Children's Oncology Group; QOL, Quality of Life.

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