

MALT Lymphoma of the Urinary Bladder Shows a Dramatic Female Predominance, Uneven Geographic Distribution, and Possible Infectious Etiology

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Abstract: Extranodal marginal zone lymphoma of mucosa-associated lymphoid tissue (MALT lymphoma) of the urinary bladder is an extremely rare entity accounting for 0.2% of all malignant urinary bladder neoplasms, and the diagnosis could be challenging. We present here a patient with urinary bladder MALT lymphoma and review of all published case reports in the literature. We summarized the reported immunophenotype of the neoplasm, ancillary studies, therapy, and follow-up for all 59 patients in the table. The median patients' age was 57 years-old (range, 17 to 88), with female predominance in 50 of 59 patients representing a 1:5.6 ratio. Geographical distribution of the reported patients was as follows: 22 from Asia, of which more than a half (16) originated from Japan; 28 from Europe, of which 19 reported from the United Kingdom, and 3 patients were reported from the United States (including our patient). Twenty-three (77%) of 30 patients, for whom their clinical presentation was recorded, had symptoms of cystitis; *Escherichia coli* was the most common pathogen. We concluded that a prominent female predominance, uneven geographic distribution of urinary bladder MALT lymphoma, and a success of antibacterial therapy in selected cases suggest the link between urinary tract infection and urinary bladder MALT lymphoma.

Keywords: MALT lymphoma, urinary bladder, cystitis, urinary tract infection

Introduction

Extranodal marginal zone lymphoma of mucosa-associated lymphoid tissue (MALT lymphoma) is a low-grade B cell lymphoma which accounts for 7–8% of all B cell lymphomas.¹ The stomach is the most common organ involved by MALT lymphoma (about 35%), followed by other anatomical locations: eyes and ocular adnexa, skin, lungs, salivary glands, breasts, and thyroid.²

The first definitive report of MALT lymphoma in urinary bladder was published in 1990 by Kuhara and colleagues.³ MALT lymphoma of the urinary bladder is an extremely rare entity and accounts to less than 1% of all non-Hodgkin lymphomas and 0.2% of all malignant urinary bladder neoplasms.⁴ The majority of patients present with hematuria and/or dysuria. The differential diagnosis could be very broad and includes inflammatory lesions, bladder carcinoma, and infections.⁵

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Some authors hypothesized that chronic antigenic stimulation and lymphoid hyperplasia caused by *Escherichia coli* or other bacterial infections might be a precursor of bladder MALT lymphomas.⁶ The positive experience in antibiotics treatment of MALT lymphoma of bladder might serve as an indirect support of this hypothesis.^{7–11}

Herein, we report and discuss a case of primary bladder MALT lymphoma and summarize other cases reported in the literature.

Case Presentation

A 58-year-old Caucasian female with history of hypertension, asthma, rheumatoid arthritis, irritable bowel syndrome, colon polyps, depression, and menopausal syndrome presented to the clinic with nonspecific urinary symptoms: dysuria, nocturia, and urinary frequency. There were no B symptoms identified. The CT demonstrated multiple thickening on the anterior and posterior bladder walls (Figure 1A and B). Consequently, patient underwent a cystoscopy evaluation with transurethral resection of bladder tumor (TURBT), which revealed 2.5 x 2.5 cm mass on posterior bladder wall distally from the trigone. The mass did not have characteristic bladder cancer architecture. The patient signed the informed consent/authorization for participation in research which includes the permission to collect and use the information from medical records, imaging studies, medical photographs, pathology images, and study results for future research projects and publications. A copy of the signed consent is kept on file in the patient electronic records.

Pathological Findings

The histologic sections showed a dense lymphocytic proliferation beneath the urothelial surface of urinary bladder mucosa. Within the lymphoid proliferation, a monomorphic population of small lymphocytes having moderately

abundant, pale staining cytoplasm was dominant. Regularly scattered, reactive lymphoid follicles were prominent within the mucosal lymphoid proliferation. The neoplastic lymphocytic proliferation had a perifollicular infiltration pattern.

Multiple immunohistochemical studies on biopsy material were performed and showed that neoplastic cells were positive for CD20, CD79a, BCL-2, and immunoglobulin kappa light chain (weak) confirming the clonality of the neoplastic cells; the neoplastic cells were negative for CD5, CD10, and immunoglobulin lambda light chain (Figure 2).

The diagnosis of MALT lymphoma of urinary bladder floor was established. No additional molecular studies were performed.

Treatment/Follow-Up

The patient received 4 cycles of Rituximab and achieved complete remission seen on the pelvic computed tomography (CT) (Figure 3). The patient showed no signs of disease with the last follow-up more than 10 years after original diagnosis.

Literature Review

The literature review was initiated starting with 1990 when Kuhara and colleagues reported what was eventually called “the first definitive report of a MALT lymphoma of the urinary bladder”.^{3,12} After a systemic search of the PubMed database for primary MALT lymphoma involving urinary bladder, the search identified 42 reports with a total of 58 patients.^{3,5–45} The available information about diagnostic immunohistochemistry, clinical manifestations, treatments, and outcomes of these cases along with a current case is summarized in Table 1.^{3,5–45} There was a strong female predominance with 50 of 59 patients being females with a male:female ratio of 1:5.6. The median patients’ age was 57 years-old (range, 17 to 88). A significant proportion of cases (22 total cases) was

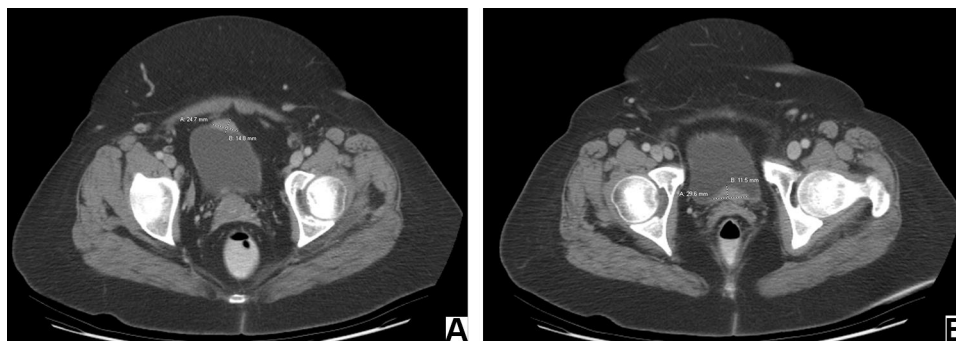


Figure 1 Axial CT images showing multiple abnormal nodular thickening on the anterior (A) and posterior (B) bladder walls.

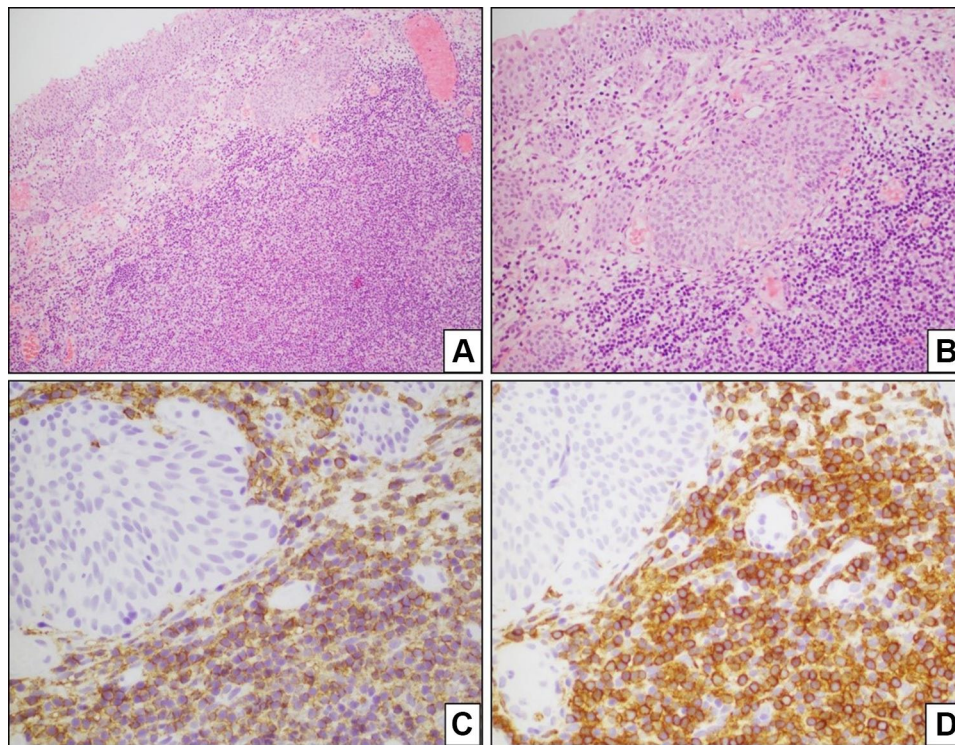


Figure 2 Bladder MALT lymphoma. The histologic sections show a dense, abnormal lymphocytic proliferation right beneath the urothelial surface of urinary bladder mucosa (**A** and **B**) the neoplastic cells are positive for CD20 (**C**) and CD79a (**D**).



Figure 3 Axial CT image of depicting the bladder and showing no evidence of abnormal nodularity 3 months later.

reported from in Asia, of which more than half (16) originated from Japan^{3,9,10,16,18,22–24,28,31,33,36,41,42,44,45} According to some of the available reports there more publications in Japanese literature which we could not find in PubMed.^{23,41} The cases reported from Asia showed even a higher female predominance where only one of 22 patients was a male.¹⁸ United Kingdom was another location with significant number of patients and accounted for

19 out of 28 European cases.^{8,12,17,20,21,25,40} Including our patient, only 3 patients were reported in the USA.^{32,34} All patients had some urinary symptoms at presentation which led to the diagnosis. Hematuria was the most common presenting symptom and was previously reported from 50.9% to 75%. Twenty three of 30 patients, for whom the information regarding presence or absence of cystitis was available, had cystitis; *Escherichia coli* was the most common pathogen.^{21,38} Xu and colleagues found that most patients, 76.5%, had a bladder solid mass on presentation.³⁸ None of patients demonstrated “B” group symptoms such as weight loss, fever, or night sweats.

Only one case of MALT lymphoma with CD5 expression was reported.¹⁰ The clonality for heavy-chain *IgH* gene rearrangement by PCR was studied in 10 cases and was found to be clonally rearranged.^{6,8,16,24,28,29,39}

Cytogenetic studies were reported in two cases.^{11,29} Krober and colleagues found that the first case was negative for t(14:18) and positive for trisomy 3, while second case showed translocation t(11;18)(q21;q21), trisomy 3, and trisomy 18.²⁹

Treatment approaches were variable including surgical excision, antibiotics, chemotherapy, radiation, or combined modality. Six patients were successfully treated

Table 1 Urinary Bladder MALT Lymphoma Cases: Diagnostics and Treatment

Case No.	Age (y. o.)	Sex	Immunohistochemistry	FISH and Molecular Study	Treatment	Follow-Up	Cystitis (Present/Absent/N/A)	Urine Culture (a Bug/Negative/N/A)	Country of Origin	Year of Report	Reference
1	56	F	Positive: CD20 (L26), CD79a (MB1) Negative: CD43 (MT1), CD45RO (UCHLI) Lambda light chain restricted	N/A	Total cystectomy	9 months after surgery, negative for recurrence	Present	Enterococcus	Japan (Asia)	1990	Kuhara et al ³
2	67	F	Positive: CD20 (L26)	N/A	Chemotherapy (CHOP)	24 months follow-up, negative for recurrence	Present	N/A	UK (Europe)	1993	Pawade et al ^{1,2}
3	74	F	Positive: CD20 (L26)	N/A	Radiotherapy	Dead (no follow-up)	Present	N/A	UK (Europe)	1993	Pawade et al ^{1,2}
4	22	F	Positive: CD20 (L26)	N/A	Chemotherapy and radiotherapy	46 months follow-up, negative for recurrence	N/A	N/A	UK (Europe)	1993	Pawade et al ^{1,2}
5	83	F	Positive: CD20 (L26)	N/A	Radiotherapy	20 months follow-up, negative for recurrence	N/A	N/A	UK (Europe)	1993	Pawade et al ^{1,2}
6	80	M	Positive: CD20 (L26)	N/A	Not treated	Died in 30 months after diagnosis of ischemic heart disease	Present	N/A	UK (Europe)	1993	Pawade et al ^{1,2}
7	73	F	Positive: CD45 (LCA), CD20 (L26), MB2 Negative: CD79a (MB1), CD45RO (UCHLI)	N/A	Chemotherapy	Died in 8 months due to unrelated to lymphoma cause. No lymphoma recurrence in bladder. Lymphoma of the thyroid.	N/A	N/A	Spain (Europe)	1996	Fernandez et al ^{1,3}

8	50	F	Positive: CD20 (L26), MB2 Kappa light chain restricted	N/A	Chemotherapy	60 months follow-up, negative for recurrence	N/A	N/A	N/A	Spain (Europe)	1996	Fernandez et al ¹³
9	75	F	Positive: CD20 (L26), MB2	N/A	Chemotherapy	9 months follow-up, negative for recurrence	N/A	N/A	N/A	Spain (Europe)	1996	Fernandez et al ¹³
10	70	F	N/A	N/A	Chemotherapy and radiotherapy	48 months follow-up, negative for recurrence	N/A	N/A	N/A	Chile (America)	1998	Gallardo et al ¹⁵
11	80	F	Positive: CD20 (L26), CD79a Negative: CD3, CD5, CD10, CD23, CD43 (MT1)	N/A	Radiotherapy	16 months follow-up, negative for recurrence	N/A	N/A	N/A	UK (Europe)	1998	Yuille et al ⁴⁰
12	77	F	Positive: CD19, CD20, Negative: CD3, CD5, CD10, CD21, CD23, CD45RO Lambda light chain restriction	Clonal heavy-chain IgH gene rearrangement (PCR)	Transurethral resection (TUR) x 2	36 months follow-up after last TUR, negative for recurrence	Present	N/A	N/A	Japan (Asia)	1999	Ando et al ¹⁶
13	27	M	N/A	N/A	Chemotherapy and radiotherapy	18 months follow-up, negative for recurrence	N/A	N/A	N/A	Japan (Asia)	2000	Kawakami et al ¹⁸
14	75	F	N/A	N/A	Chemotherapy and radiotherapy	36 months follow-up, negative for recurrence	N/A	N/A	N/A	France (Europe)	2000	Tasu et al ¹⁹
15	66	F	Positive: CD20	N/A	N/A	12 months follow-up, negative for recurrence	N/A	N/A	N/A	UK (Europe)	2000	Bates et al ¹⁷
16	79	F	Positive: CD20	N/A	N/A	No follow-up	N/A	N/A	N/A	UK (Europe)	2000	Bates et al ¹⁷
17	59	F	Positive: CD20, CD43	N/A	N/A	36 months follow-up, positive for recurrence	N/A	N/A	N/A	UK (Europe)	2000	Bates et al ¹⁷

(Continued)

Table 1 (Continued).

Case No.	Age (y. o.)	Sex	Immunohistochemistry	FISH and Molecular Study	Treatment	Follow-Up	Cystitis (Present/Absent/N/A)	Urine Culture (a Bug/Negative/N/A)	Country of Origin	Year of Report	Reference
18	64	F	Positive: CD20, CD45 Negative: CD43 Light chain restriction: inconclusive	Clonal heavy-chain IgH gene rearrangement (PCR)	Radiotherapy	156 months follow-up, negative for recurrence	Present	Staphylococci, Streptococci, <i>Escherichia coli</i> , Diphtheroid bacillus	Canada (America)	2001	Al-Maghrabi et al ⁶
19	69	F	Positive: CD20, CD45 Negative: CD5, CD10, CD43, CD45RO Lambda light chain restriction	Clonal heavy-chain IgH gene rearrangement (PCR)	Radiotherapy	60 months follow-up, negative for recurrence	Present	<i>Escherichia coli</i>	Canada (America)	2001	Al-Maghrabi et al ⁶
20	72	F	Positive: CD20, CD45 Negative: CD5, CD10, CD43, CD45RO Kappa light chain restriction	Inconclusive results of heavy-chain IgH gene rearrangement (PCR)	Radiotherapy	36 months follow-up, negative for recurrence	Present	<i>Escherichia coli</i>	Canada (America)	2001	Al-Maghrabi et al ⁶
21	62	M	Positive: CD19, CD20, CD43 (focal) Negative: CD5, CD10, CD23, CD45RO Kappa light chain restriction	Clonal heavy-chain IgH gene rearrangement (PCR)	Radiotherapy	24 months follow-up, negative for recurrence	Present	<i>Staphylococcus aureus</i>	Canada (America)	2001	Al-Maghrabi et al ⁶
22	65	F	Positive: CD20, CD79 Negative: IgD, CD43	N/A	Chemotherapy (CHOP)	36 months follow-up, negative for recurrence	Present	Coliform Bacteria	UK (Europe)	2001	Wazait et al ²⁰
23	70	F	Positive: CD20, CD79 Negative: CD43	N/A	Chemotherapy (Chlorambucil)	60 months follow-up, negative for recurrence	N/A	N/A	UK (Europe)	2001	Wazait et al ²⁰
24	70	F	Positive: CD20 Negative: CD43	N/A	Chemotherapy and radiotherapy	48 months follow-up, negative for recurrence	N/A	N/A	Chile (America)	2001	Painemal Duarte et al ⁴³

25	59	M	Positive: CD20, CD79a Negative: CD3, CD5, CD10, CD23, CD43, CD45RO, BCL6, cyclin D1	N/A	Antibiotics (First paper to use HP eradication therapy which works; H. Pylori test was positive)	36 months follow-up, negative for recurrence	Absent	Negative	Netherland (Europe)	2002	van den Bosch et al ⁷
26	57	M	Positive: CD20 Negative: CD3, CD5, CD10, CD23, CD43, cyclin D1 Ki-67 - low	Negative for t (14;18) Trisomy of Chromosome 3	Antibiotics treatment against H. Pylori (even H. Pylori test was negative)	36 months follow-up, negative for recurrence	N/A	N/A	Germany (Europe)	2002	Krober et al ¹¹
27	78	F	Positive: CD20, CD79	Clonal heavy-chain IgH gene rearrangement (PCR)	Antibiotics (trimethoprim, nitrofurantoin, and cephadrine)	19 months follow-up, negative for recurrence	Present	<i>Escherichia coli</i>	UK (Europe)	2002	Oscier et al ⁸
28	82	F	N/A	N/A	Chemotherapy (ChVP)	Died, negative for recurrence	N/A	N/A	UK (Europe)	2005	Hughes et al ^{2,1}
29	81	F	N/A	N/A	Diathermy	12 months follow-up, negative for recurrence	N/A	N/A	UK (Europe)	2005	Hughes et al ^{2,1}
30	28	M	N/A	N/A	Chemotherapy (ChVP)	120 months follow- up, negative for recurrence	N/A	N/A	UK (Europe)	2005	Hughes et al ^{2,1}
31	76	F	N/A	N/A	Radiotherapy	24 months follow-up, negative for recurrence	N/A	N/A	UK (Europe)	2005	Hughes et al ^{2,1}
32	77	M	N/A	N/A	Chemotherapy (ChD)	48 months follow-up, negative for recurrence	N/A	N/A	UK (Europe)	2005	Hughes et al ^{2,1}
33	66	F	N/A	N/A	Radiotherapy	Died, negative for recurrence	Present	N/A	UK (Europe)	2005	Hughes et al ^{2,1}

(Continued)

Table 1 (Continued).

Case No.	Age (y. o.)	Sex	Immunohistochemistry	FISH and Molecular Study	Treatment	Follow-Up	Cystitis (Present/Absent/N/A)	Urine Culture (a Bug/Negative/N/A)	Country of Origin	Year of Report	Reference
34	85	F	N/A	N/A	Radiotherapy	Negative for recurrence	N/A	N/A	Japan (Asia)	2005	Takahara et al ²²
35	84	F	N/A	N/A	Chemotherapy (R-CHOP)	N/A	N/A	N/A	Japan (Asia)	2006	Kakuta et al ⁴¹
36	84	F	N/A	N/A	Radiotherapy	14 months follow-up, negative for recurrence	Present	<i>Escherichia coli</i>	Japan (Asia)	2007	Hatano et al ²³
37	64	F	Positive: CD20, BCL2 Negative: CD5, CD10, cyclin D1 Ki-67 - low	Clonal heavy-chain IgH gene rearrangement (PCR)	Transurethral resection (TUR) and radiotherapy	19 months later recurred in stomach	Absent	Negative	Japan (Asia)	2007	Ueno et al ²⁴
38	69	F	Positive: CD20, CD79a Negative: CD5, CD10	N/A	Antibiotics	25 months follow-up, negative for recurrence	Present	N/A	Japan (Asia)	2008	Fujimura et al ⁹
39	64	F	N/A	N/A	Radiotherapy	14 months follow-up, negative for recurrence	Present	<i>Escherichia coli</i>	Japan (Asia)	2008	Terasaki et al ⁴²
40	31	F	Ki-67 ~ 20-25%	N/A	Chemotherapy (CHOP)	N/A	N/A	N/A	UK (Europe)	2010	Sen et al ²⁵
41	88	F	Positive: CD5, CD20, CD79a, CD45, BCL2, p53 Negative: CD10, CD15, CD23, CD30, CD34, CD43, CD56, cyclin D1, TdT Lambda light chain restriction Ki-67 ~ 50%	N/A	Antibiotics	5 months follow-up, negative for recurrence	N/A	N/A	Japan (Asia)	2011	Terada et al ¹⁰

42	65	F	Positive: CD20, BCL2 Negative: CD3, CD5, CD10, cyclin D1, CD21, CD23, CD15, CD30 Ki-67 ~ 5–10%	N/A	Chemotherapy (R-CHOP)	Recur 12 months after treatment; died of septicemic shock secondary to a bladder abscess	Absent	N/A	Malaysia (Asia)	2011	Maninderpal et al ²⁶
43	17	F	Positive: CD20, BCL2, CD45 Ki-67 ~ 25%	N/A	Transurethral resection (TUR) and chemotherapy	24 months follow-up, negative for recurrence	N/A	N/A	Poland (Europe)	2011	Szopinski et al ²⁷
44	68	F	Positive: CD20, CD79a Negative: CD3, CD5, CD10 Kappa light chain restriction	Clonal heavy-chain IgH gene rearrangement (PCR)	Chemotherapy (rituximab)	Negative for recurrence	Absent	N/A	Japan (Asia)	2012	Morita et al ²⁸
45	72	F	N/A	N/A	Chemotherapy (rituximab) and radiotherapy	N/A	Present	N/A	Japan (Asia)	2013	Mizumo et al ⁴⁴
46	71	F	Positive: CD20 Negative: CD3	N/A	Transurethral resection (TUR)	N/A	Present	N/A	Japan (Asia)	2013	Takahashi et al ³¹
47	48	M	Positive: CD20, BCL2 Negative: CD5, CD23, CD43, cyclin D1 Ki-67 ~ 5% Kappa light chain restriction	N/A	Chemotherapy (R-CHOP), radiotherapy, antibiotics	N/A	Present	<i>Escherichia coli</i>	Croatia (Europe)	2013	Bacalja et al ³⁰
48	72	F	Positive: CD20, CD79a, BCL2, IgD Negative: CD5, CD10, BCL6, cyclin D1 Ki-67 ~ 15%	Clonal heavy-chain IgH gene rearrangement (PCR); FISH - t (11;18)(q21;q21); Trisomy of Chromosome 3 and 18	Antibiotics (ciprofloxacin for 6 weeks)	6 months follow-up, negative for recurrence	Present	<i>Escherichia coli</i>	Italy (Europe)	2013	Lucioni et al ²⁹

(Continued)

Table 1 (Continued).

Case No.	Age (y. o.)	Sex	Immunohistochemistry	FISH and Molecular Study	Treatment	Follow-Up	Cystitis (Present/Absent/N/A)	Urine Culture (a Bug/Negative/N/A)	Country of Origin	Year of Report	Reference
49	63	F	Positive: CD20, BCL2 Negative: CD3, CD5, CD10, cyclin D1 Ki-67 ~ 20% Lambda light chain restriction	Clonal heavy-chain IgH gene rearrangement (PCR)	Radiotherapy	11 months follow-up, negative for recurrence	Absent	Negative	Taiwan (Asia)	2014	Chen et al ³⁹
50	54	M	Positive: CD20 Negative: CD3, CD10, BCL6, cyclin D1	N/A	Radiotherapy	36 months follow-up, negative for recurrence	Absent	Negative	USA (America)	2014	Haddad-Lacle et al ³²
51	78	F	Positive: CD20, CD79a, BCL2 Negative: CD3, CD10, CD23, cyclin D1 Ki-67 ~ 20% Kappa light chain restriction	N/A	Chemotherapy (rituximab)	N/A	Present	<i>Escherichia coli</i>	Japan (Asia)	2014	Matsuda et al ³³
52	76	F	Positive: CD20, BCL2 Negative: CD3, CD10	N/A	Radiotherapy	3 months follow-up, negative for recurrence	N/A	N/A	Taiwan (Asia)	2015	Hsu et al ³⁵
53	65	F	Positive: CD20, PAX5 Negative: CD5, CD10	N/A	A transurethral resection of the bladder tumor (TURBT) and radiotherapy	3 months follow-up, negative for recurrence	N/A	N/A	USA (America)	2015	Vempati et al ³⁴
54	53	F	Positive: CD20, CD45 Negative: CD3, CD5, CD10, BCL2	N/A	Chemotherapy (R-CHOP)	9 months follow-up, negative for recurrence	Present	Negative	India (Asia)	2016	Jitani et al ⁵
55	72	F	N/A	N/A	Transurethral resection of bladder tumors (TURBT)	13 months follow-up, negative for recurrence	N/A	N/A	Japan (Asia)	2018	Ozawa et al ⁴⁵

56	77	F	Positive: CD20, CD79a, BCL2	N/A	Radiotherapy	60 months follow-up, negative for recurrence	Present	<i>Escherichia coli</i>	Japan (Asia)	2018	Isono et al ³⁶
57	74	F	Positive: CD20	N/A	Radiotherapy	N/A	Present	Negative	Singapore (Asia)	2019	Kadam et al ³⁷
58	77	F	Positive: CD20, PAX5, BCL2, CD21 Negative: CD10, MUM1, TDT, cyclin D1	N/A	Transurethral resection of bladder tumors (TURBT)	The patient was alive and healthy at the 15-month follow-up	N/A	N/A	China (Asia)	2020	Xu et al ³⁸
59	58	F	Positive: CD20, CD79a, BCL2 Negative: CD5, CD10	N/A	Chemotherapy (rituximab)	120 months follow-up, negative for recurrence	Absent	N/A	USA (America)	2020	Lyapichev et al.

Abbreviations: F, female; M, male; y.o., years old; N/A, not available or provided not in English; CHOP, cyclophosphamide, doxorubicin, vincristine and prednisolone; R-CHOP, rituximab with CHOP; CHVP, Chi, chlorambucil; V, vincristine; P, prednisolone; ChID, Chi, chlorambucil; D, dexamethasone; FISH, fluorescent in situ hybridization; PCR, polymerase chain reaction.

with antibiotics.^{7-9,11,29} Eight patients had some surgical procedures with or without consequent radiotherapy and/or chemotherapy.^{3,16,24,27,31,34,38,45} Hughes and colleagues reported one patient who was successfully treated by diathermy.²¹ Majority of the patients (24) were treated with chemotherapy either alone (16) or in combination with radiation (8) (Table 1). Three cases did not have any information about therapeutic approach.¹⁷ Overall the outcome of the treatment was good with median follow-up time of 64.5 months (from 3 to 156 months).

It is important to acknowledge the limitations of our review. It is possible that some reports did not specify the urinary bladder as an involvement site, so we cannot exclude the possibility of missing a significant number of cases. This is a retrospective study, and patients have not been studied and treated uniformly; therefore, it is impossible to draw a definitive conclusion regarding the pathogenesis of MALT lymphoma of the urinary bladder.

The patient we report has a history of rheumatoid arthritis (RA). The relationship between RA and MALT lymphoma in this patient remains unclear. An increased risk of malignant lymphoma has been reported in patients with RA,^{46,47} however, patients with RA usually develop diffuse large B-cell lymphoma.⁴⁸ While MALT lymphoma is common in patients suffering from primary Sjogren syndrome,⁴⁹ MALT lymphoma in patients with RA are exceedingly rare; we identified only 11 single case reports in the literature.⁵⁰⁻⁶⁰

Conclusion

In summary, MALT lymphoma of the urinary bladder is a rare low-grade extranodal B-cell lymphoma which predominantly affects elderly women of Asian origin. The disease often presents with nonspecific symptoms and is strongly associated with cystitis.^{14,34} The prognosis is generally excellent. Tissue biopsy with immunohistochemistry is crucial to reach the final diagnosis. A prominent female predominance, uneven geographic distribution of the cases, dramatic prevalence of cystitis among affected patients, and a success of antibacterial therapy in selected cases suggest the role of urinary tract infection, particularly *E. coli*, in the pathogenesis of urinary bladder MALT lymphoma.

Ethics Approval and Informed Consent

The patient reported in the manuscript signed the informed consent/authorization for participation in research (MD Anderson Cancer Center protocol LAB01-473) which

includes the permission to use data collected in future research projects including presented case details and images used in this manuscript. A copy of the signed consent is kept on file in the patient electronic records.

Disclosure

The authors declare no conflicts of interest for this work and that there are no conflicts of interest regarding the publication of this article.

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