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Mycosis fungoides with CD20 expression: report of two cases and review of the literature

CD20 expression is exceedingly rare in T-cell lymphomas. Most published cases have been diagnosed as peripheral T-cell lymphomas, not otherwise specified. Only 18 cases of CD20-positive mycosis fungoides (MF) have been previously reported. Here, we describe two cases of CD20-positive MF. Patient 1 was an 84-year-old woman who presented with a 5-year history of multiple pruritic erythematous papules coalescing into thin plaques over 80% of her body surface area. She expired after developing tumors and large cell transformation. Patient 2 was a 67-year-old woman with a long-standing history of tumor stage MF with large cell transformation. She developed a nodular plaque while receiving topical and systemic therapy. In both cases, the neoplastic T-cells demonstrated a CD4-positive immunophenotype with loss of pan-T-cell markers and a monoclonal T-cell receptor gamma gene rearrangement. CD20 was expressed by a significant population of the neoplastic T-cells, but these T-cells lacked expression of other B-cell markers, including CD79a, CD19 and PAX5. This report adds to and summarizes the small body of literature describing CD20-positive MF, and discusses diagnostic and clinical implications.

Keywords: CD20, CTCL, lymphoma, mycosis fungoides

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CD20 is a 33- to 37-kDa transmembrane phosphoprotein expressed on B-cells that is thought to regulate cellular calcium transport and thus cell activation.[1,2] It is expressed during B-cell development, and expression is lost during differentiation to plasma cells.[2] CD20 is a well-characterized marker of B-cell lymphomas and leukemias.[2] However, rare cases of CD20-positive, mature T-cell lymphomas have been described.[3–9] The majority of reported cases are extracutaneous and do not meet the criteria for defined subtypes of T-cell lymphoma. They have therefore been classified as peripheral T-cell lymphoma, not otherwise specified (PTCL, NOS), formerly termed peripheral T-cell lymphoma-unspecified (PTCL-U).[6,10,11] To our knowledge, only 18 cases of CD20-positive T-cell lymphomas have been designated as mycosis fungoides (MF).[3,6,7,12–15] Here, we report two additional cases of CD20-positive MF, review the literature and discuss diagnostic and clinical implications.

Patient 1

An 84-year-old woman with a remote history of breast cancer presented with pruritic, erythematous, scaly papules and plaques that progressed over

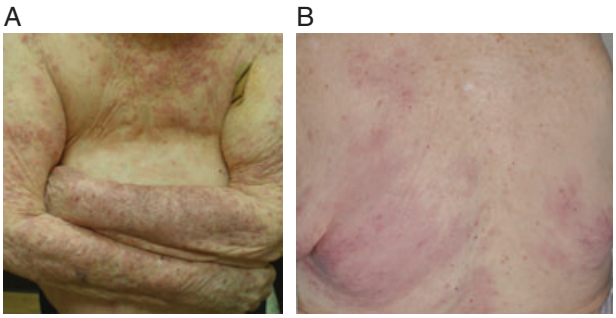

Fig. 1. A clinical photograph of case 1 at the time of presentation to our institution shows multiple erythematous papules coalescing into plaques (A). The skin lesions significantly improved after 8 days of treatment with topical steroids under occlusion and PUVA phototherapy (B).

a span of 5 years to involve 80% of her body surface area (Fig. 1A). The patient reported that her skin rash began as itchy red bumps that she interpreted as poison ivy. Her lesions progressed and she eventually sought medical attention. Upon presentation to an outside dermatologist, she was noted to have fine erythematous papules and plaques extensively involving her chest, arms, back and upper thighs in a background of extreme xerosis. Her lesions waxed and waned and were variably treated with courses of topical and oral steroids. Given the extent of her lesions, she was hospitalized on two occasions. A biopsy was eventually performed by her outside dermatologist on a right supraclavicular plaque. The clinical differential diagnosis included a drug eruption, atopic dermatitis, urticaria, bullous pemphigoid and dermatitis herpetiformis. H&E-stained sections revealed features highly concerning for MF; however, a lymphomatoid drug reaction could not be entirely excluded. The patient was referred to our institution for further evaluation.

At our institution, physical examination revealed erythematous, scaly, papules and plaques without vesiculation on the patient's face, trunk and extremities with involvement of 80% of her body surface area. The lesions were not follicularly-based or annular, and there was no associated alopecia or ulceration. The clinical differential diagnosis at this time included MF, eczema and a drug eruption. Although she was taking several medications, there was no temporal relationship between the onset of the patient's lesions and her medications. Repeat biopsy from the skin of the left upper arm demonstrated findings consistent with the diagnosis of MF. The patient also had palpable right inguinal lymphadenopathy that was evaluated by positron emission tomography-computed tomography (PET-CT) and found to have normal metabolic uptake. No peripheral blood involvement was identified. Given her erythrodermic presentation and her skin biopsy findings, she was diagnosed with MF, stage IIIA.[16] She was treated with inpatient modified Goeckerman therapy using topical corticosteroids under occlusion with psoralen plus ultraviolet A (PUVA) phototherapy. The patient significantly improved after 8 days of treatment (Fig. 1B). An ensuing flare of her disease was treated successfully with 8 days of modified Goeckerman therapy. She was subsequently lost to follow-up at our institution. However, review of outside medical records revealed that the patient ultimately progressed to tumor stage MF with large cell transformation and expired due to 'immunodeficiency'. She had two additional outside biopsies. A biopsy from a right arm plaque revealed MF with folliculotropism. A subsequent biopsy taken from a right neck tumor revealed MF with large cell transformation.

Patient 2

A 67-year-old woman with a long-standing history of MF, stage IIB with large cell transformation, presented with an enlarging, erythematous-to-violaceous nodular plaque on her right shin. This plaque developed during treatment with bexarotene (75 mg, three times per week), narrow band ultraviolet B phototherapy three times per week, and clobetasol. The patient was diagnosed with MF in 2008 and developed tumors with large cell transformation in 2010. Her diagnosis of MF was confirmed on multiple biopsies from different anatomic sites, and included an abnormal immunophenotype and a monoclonal T-cell population.

Materials and methods

Hematoxylin and eosin-stained sections from the formalin-fixed, paraffin-embedded tissues were prepared using a standard protocol. All staining was performed using a Ventana Benchmark Ultra automated immunostainer (Ventana Medical Systems, Tucson, AZ, USA) according to standard protocols at the University of Michigan Department of Pathology. The following antibodies were used: CD2 (Leica Microsystems, Buffalo Grove, IL, USA, 1 : 40), CD3 (Ventana, predilute), CD4 (Leica, 1 : 40), CD5 (Ventana, predilute), CD7 (Ventana, predilute), CD8 (Ventana, predilute), CD30 (Dako North America, Inc., Carpinteria, CA, USA, 1 : 100), CD20 (Ventana, predilute), CD79a (Dako, 1 : 100), CD19 (Cell Marque Corporation, Rocklin, CA, USA, 1 : 25), PAX5 (BD Biosciences, San Jose, CA, USA, 1 : 25), BCL6 (Ventana, predilute), and CD10 (Ventana, predilute), and CD3/CD20 dual immunohistochemical study (Ventana, predilute). The chromogen used was 0.05% DAB

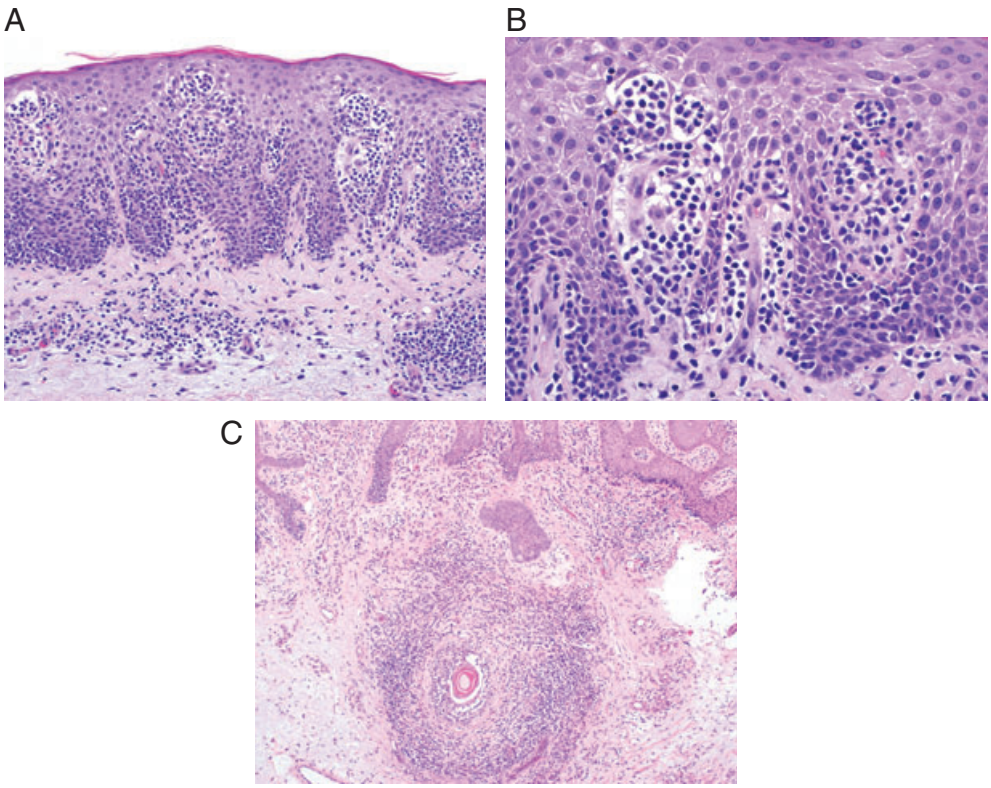

Fig. 2. Hematoxylin and eosin-stained section of a punch biopsy from the left upper arm (Patient 1) demonstrates atypical dermal and epidermotropic lymphocytes with the formation of Pautrier collections (A,B). A subsequent biopsy also revealed folliculotropism (C). 200× (A), 400× (B) and 100× (C).

(diaminobenzidine tetrahydrochloride, Dako) for single antigen studies and DAB was combined with alkaline phosphatase (ultraView Universal Alkaline Phosphatase Red Detection Kit, Ventana, predilute) for the CD3/CD20 combined study. DAB was used for CD20 and alkaline phosphatase red was used for CD3. The counterstain was Harris hematoxylin. All immunohistochemical studies included appropriately positive and negative controls.

For detection of monoclonal T-cell receptor gamma chain (TCR-γ) and immunoglobulin heavy chain (IgH) rearrangement, genomic DNA was extracted from paraffin-embedded tissue and amplified by multiplex polymerase chain reaction using a set of 5′-fluorescent end-labeled primers that anneal to conserved sequences in the V regions and J regions of the TCR gene or to the three conserved framework regions of the IgH gene (FR1, FR2, FR3). The amplified products were then subjected to fractionation using capillary electrophoresis and detected through differential fluorescence emission.

Results

Case 1

Of the patient's four biopsies, two revealed neoplastic T-cells with aberrant CD20 expression: a punch biopsy of a plaque from the left upper arm and a biopsy of a tumor from the right neck. The punch biopsy from the left upper arm demonstrated characteristic features of MF including small- to medium-sized atypical lymphocytes within the epidermis and upper dermis that were associated with minimal spongiosis, formed Pautrier collections, and tagged the dermal-epidermal junction (Figs. 2A,B and 4A). The lymphocytes were enlarged and displayed hyperchromatic nuclei and irregular nuclear contours. In the superficial dermis, they showed a patchy, band-like distribution and were associated with wiry fibrosis. Folliculotropism was not identified in this biopsy; however, a subsequent biopsy from the right arm revealed follicular involvement (Fig. 2C). In addition, the T-cell immunophenotype was abnormal. Specifically, the epidermotropic lymphocytes in the left arm biopsy expressed the T-cell markers CD3 (Figs. 3B and 4B,D), CD4 (Fig. 3C) and CD5 (Fig. 3D), but lacked expression of CD7 (Fig. 3E) and partially lacked CD2 (expressed by approximately 75% of cells; Fig. 3A). The CD4 to CD8 ratio was greatly increased (>10 : 1; Figs. 3C,F). A small subset (10–15%) of atypical dermal and epidermotropic lymphocytes also expressed CD30. Interestingly, CD20, a B-cell marker, was expressed in a significant subset

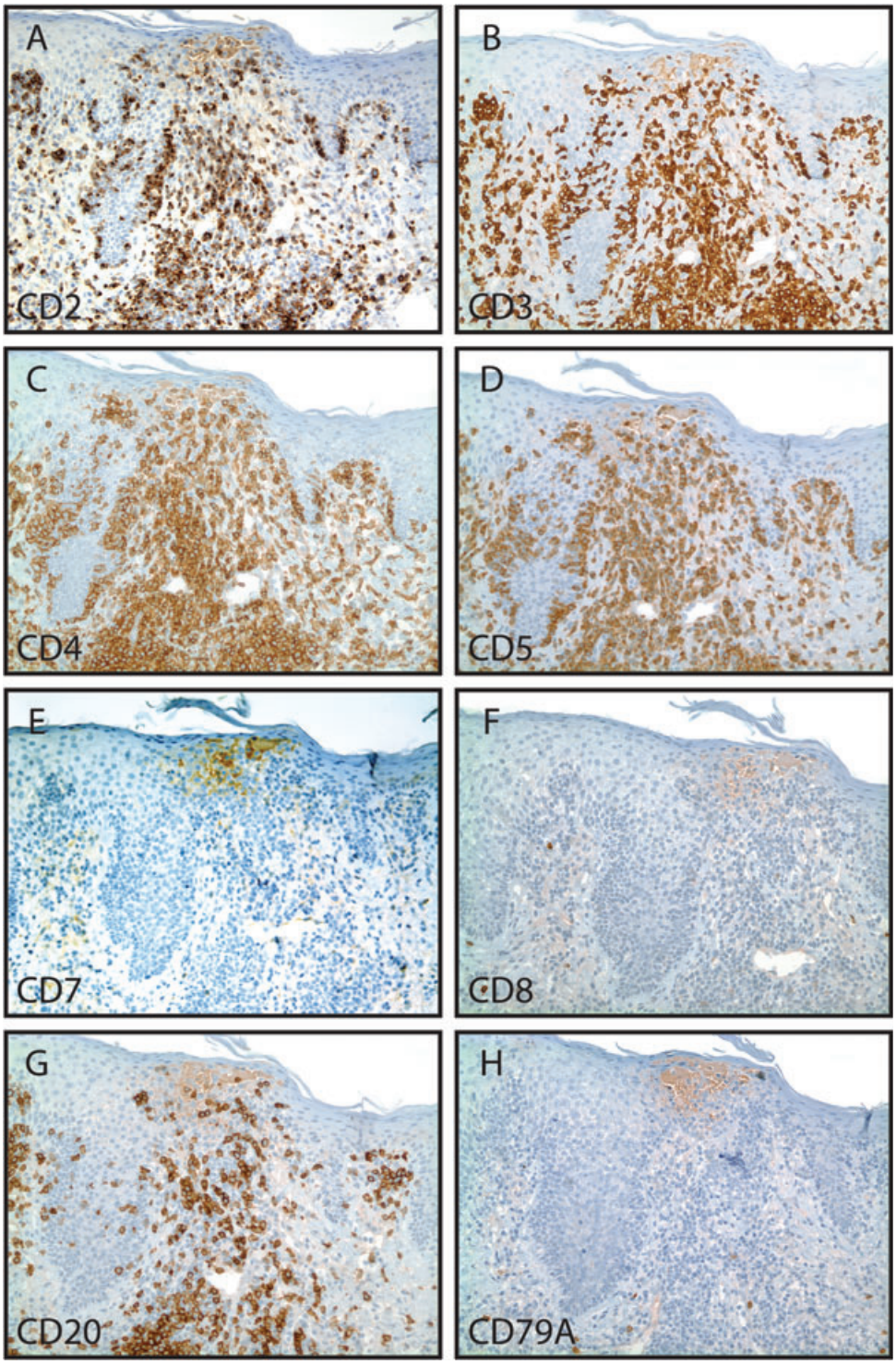

Fig. 3. Immunohistochemical studies performed on case 1 demonstrate CD2+/− (A), CD3+ (B), CD4+ (C) and CD5+ (D) T-lymphocytes. The lymphocytes lack expression of CD7 (E) and CD8 (F). The CD4 : CD8 ratio is greatly increased (C, F). The atypical lymphocytes express CD20 (G), but not CD79a (H). 200× (A–H).

of dermal and epidermotropic atypical T-cells (30%; Figs. 3G and 4C,D). This finding was confirmed on a repeat CD20 immunohistochemical study, as well as a dual CD3 and CD20 immunohistochemical study (Fig. 4D). These CD20-positive atypical lymphocytes also appeared to express the T-cell markers CD2, CD3, CD4 and CD5 (Fig. 3A–D), but did not express the B-cell markers CD79a (Fig. 3H), CD19, or PAX5. In addition, no expression of BCL6 or CD10 was identified.

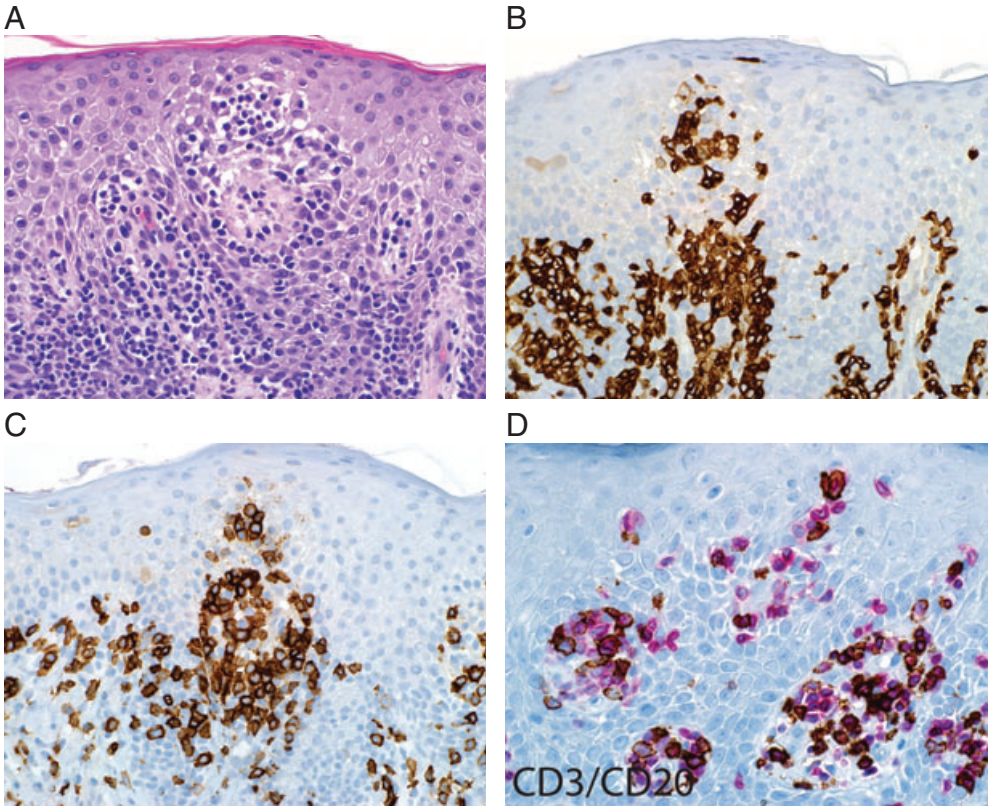

Fig. 4. A higher power view (Patient 1) shows epidermotropic lymphocytes (A), with expression of CD3 (B, D) and CD20 (C, D). Co-expression of CD3 and CD20 is confirmed on a dual CD3/CD20 immunohistochemical study (D; CD3 in red, CD20 in brown). 400× (A–C), 600× (D).

Gene rearrangement studies for TCR-γ and IgH genes were performed on the left upper arm biopsy using DNA extracted from paraffin sections. In addition, gene rearrangement studies were performed on the patient's initial right supraclavicular biopsy. Importantly, an identical, monoclonal rearrangement of the TCR-γ gene was identified in both the left upper arm and the right supraclavicular biopsies. There was no clonal rearrangement of the IgH gene (Table 1).

The right neck tumor revealed sheets of large, atypical lymphoid cells with nuclear hyperchromasia and pleomorphism and variably prominent nucleoli (Fig. 5A). These cells diffusely expressed CD3 (Fig. 5B,E), CD4, CD5 and CD30 (Fig. 5C). They also showed diffuse, weak expression of CD20 (100% of cells; Fig. 5D,E), including on a combined CD3 and CD20 immunohistochemical study (Fig. 5E). They did not express CD79a.

Case 2

Punch biopsy from the right shin revealed a diffuse dermal infiltrate of mostly large lymphoid cells with open chromatin and conspicuous nucleoli (Fig. 6A). These lymphoid cells infiltrated the epidermis, where they formed small aggregates compatible with Pautrier collections (Fig. 6B). By immunohistochemistry, the large lymphoid cells were CD3-positive (Fig. 7A,D) and also diffusely, weakly expressed CD20 (100% of cells; Fig. 7B,D). CD79a (Fig. 7C), CD19 and PAX5 were negative. CD30 marked a rare cell. Immunophenotypic evaluation in previous biopsies in this patient revealed that her lymphoma was composed of CD4-positive T-cells with loss of CD2 and CD7 (expressed by <10% of T-cells, each) and weak, diffuse expression of CD5. Further, a prior gene rearrangement study showed a monoclonal T-cell population.

Discussion

Expression of the B-cell marker CD20 is extremely rare in T-cell neoplasms. Of these neoplasms, CD20 is most commonly identified in peripheral T-cell lymphomas.[6] Here, we report two cases of CD20-positive MF. In case 1, the patient demonstrated a more eczematous presentation with papules and plaques covering more than 80% of her body surface. A drug reaction was initially considered in the clinical and histopathologic differential diagnosis, highlighting that MF is a 'great imitator' and may mimic a variety of clinical entities.[17] Given the patient's persistent, progressive papules and plaques

Table 1. Summary of current and reported cases of CD20-positive mycosis fungoides*

Case	Reference	Age/Sex	T-cell immunophenotype	B-cell immunophenotype	Molecular studies	Clinical course
1	Current	84/F	CD2$^{+/-}$, CD3^{+}, CD4^{+}, CD5^{+}, CD7^{-}, CD8^{-}, CD30^{+}	CD20$^{+\ (weak)}$, CD79a^{-}, CD19^{-}, PAX5^{-}	TCR-γ clone IgH negative	Erythroderma treated with topical steroids under occlusion and PUVA on two occasions, eventual development of tumors with large cell transformation. Dead 2 years after diagnosis.
2	Current	67/F	CD3^{+}, CD4^{+}, CD2^{-}, CD5$^{+\ (weak)}$, CD7^{-}, CD30^{-}	CD20$^{+\ (weak)}$, CD79a^{-}, CD19^{-}, PAX5^{-}	TCR-γ clone	Progression from patches and plaques to tumors with large cell transformation.
3	Martin[3]	83/M	CD2^{+}, CD3^{+}, CD4^{+}, CD5^{+}, CD7^{-}, CD30$^{+/-}$	CD20^{+}, CD79a^{-}, PAX5^{-}	TCR-γ and TCR-β clones IgH negative	Patches and thick plaques with ulceration. Remission with topical steroids, radiotherapy, PUVA.
4	Rahemtullah[6]	74/M	CD3^{+}, CD4^{+}, CD5^{+}, CD7$^{+(weak)}$, CD8^{-}, CD30^{+}	CD20^{+}, PAX5^{-}	TCRγ clone IgH did not amplify	Multiple skin lesions not further described. Large cell transformation; multiple cutaneous relapses. Dead at 35 months
5	Rahemtullah[6]	80/M	CD3^{+}, CD4^{+}, CD5^{+}, CD7^{-}, CD8^{-}, CD30^{-}	CD20^{+}, CD79a^{-}, PAX5^{-}	TCRγ clone IgH negative	Two plaques present for 15-years. Recent diagnosis at time of publication.
6	Sen[7]	53/M	CD2^{+}, CD3^{+}, CD4^{+}, CD5^{+}, CD8^{-}, CD7^{-}	CD20$^{-/+(weak)}$, CD79a^{-}, PAX5^{-}	TCR-γ clone IgH negative	Worsening patches and plaques. Disease progression to involve lymph node and form a tumor. Stable disease after treatment with bexarotene, PUVA, interferon, and radiation.
7	Song[12]	78/M	CD3^{+}, CD4^{-}, CD5^{-}, CD7^{-}, CD8^{-}	CD20^{+}	Unknown	Progression from patches and plaques to tumors with increased large cells ($<$25%).
8	Hagen[15]	14/M	CD3^{+}, CD4^{+}, CD5^{+}, CD7$^{-/+}$, CD8^{-}, CD30^{-}	CD20^{+}, CD79a^{-}, PAX5^{-}	TCR-γ clone	Solitary, 3 cm patch. Partial resolution with topical steroids.
9	Hagen[15]	44/M	CD3^{+}, CD4^{+}, CD7$^{-/+}$, CD8^{-}	CD20$^{+/-}$, PAX5$^{-/+}$	No TCR-γ clone	Patches and plaques with a waxing and waning course.
10	Hagen[15]	80/F	BF1^{+}, CD2^{+}, CD3^{+}, CD4^{+}, CD5$^{-/+}$, CD7$^{-/+}$, CD8^{-}	CD20^{+}	TCR-γ clone IgH negative	Crusted nodules representing folliculotropic MF with development of tumors and large cell transformation.
11	Jullie[13]	79/M	CD3^{+}, CD30$^{-/+}$	CD20$^{+/-}$, CD22^{-}, PAX5^{-}	TCR-γ clone IgH not amplified	Patches and tumors with large cell transformation and lymph node involvement. Eventual death from disease.
12	Jullie[13]	32/F	CD3^{+}, CD30$^{-/+}$	CD20^{+}, CD22^{-}, PAX5^{-}	TCR-γ clone IgH negative	Patches and tumors with large cell transformation and lymph node involvement. Disease progression.
13	Jullie[13]	50/F	CD3^{+}, CD30$^{-/+}$	CD20$^{+/-}$, CD22^{-}, PAX5^{-}	TCR-γ clone IgH minor clone	Patches and tumors with large cell transformation and disease progression.
14	Jullie[13]	67/F	CD3^{+}, CD30^{-}	CD20^{+}, CD22^{-}, PAX5^{-}	TCR-γ clone IgH not amplified	Patches and tumors with large cell transformation. Eventual death from disease.
15	Jullie[13]	88/F	CD3^{+}, CD30$^{-/+}$	CD20^{+}, CD22^{-}, PAX5^{-}	TCR-γ clone IgH not done	Not available
16	Jullie[13]	92/M	CD3^{+}, CD30^{-}	CD20^{+}, CD22^{-}, PAX5^{-}	TCR-γ clone IgH not amplified	Not available

* +/− Indicates partial expression of antigen with $\geq$30% of cells positive; −/+ indicates $<$30% of cells are positive.

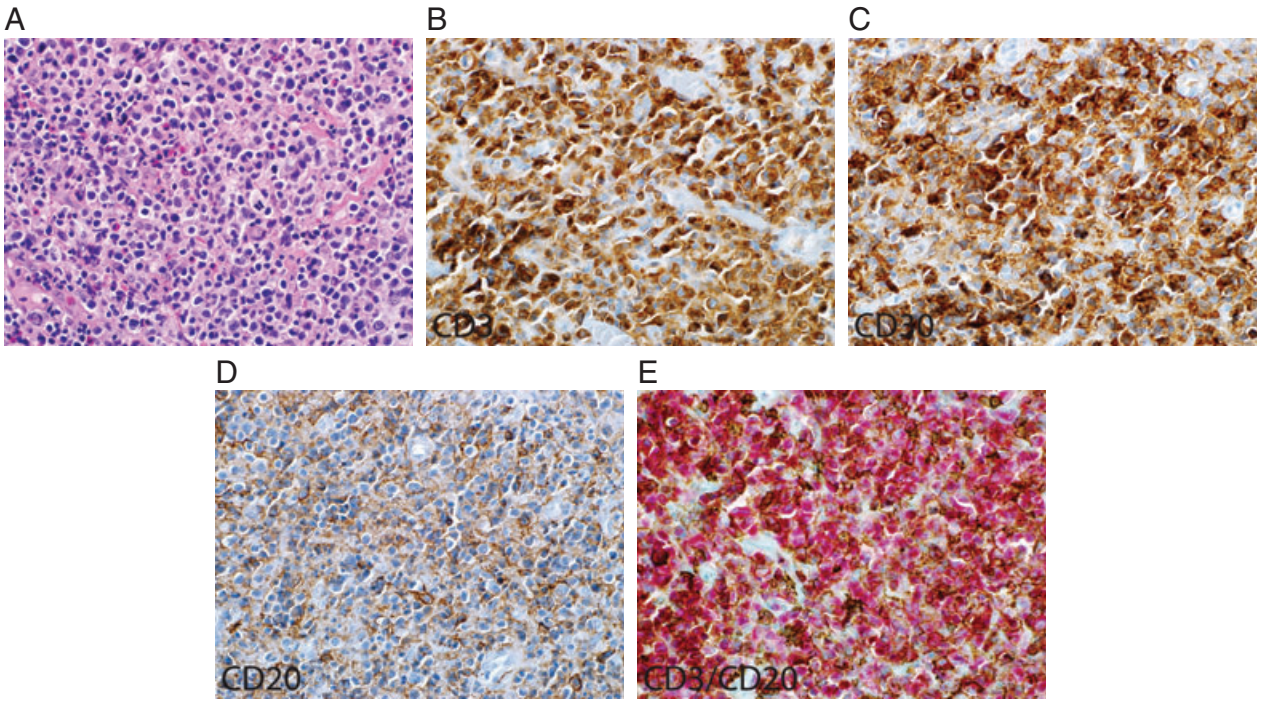

Fig. 5. A subsequent biopsy of a tumor (Patient 1) reveals sheets of large, atypical lymphoid cells (A) that express CD3 (B, E), CD30 (C) and CD20 (D, E). Co-expression of CD3 and CD20 is confirmed on a dual CD3/CD20 immunohistochemical study (E; CD3 in red, CD20 in brown). 400X (A–E).

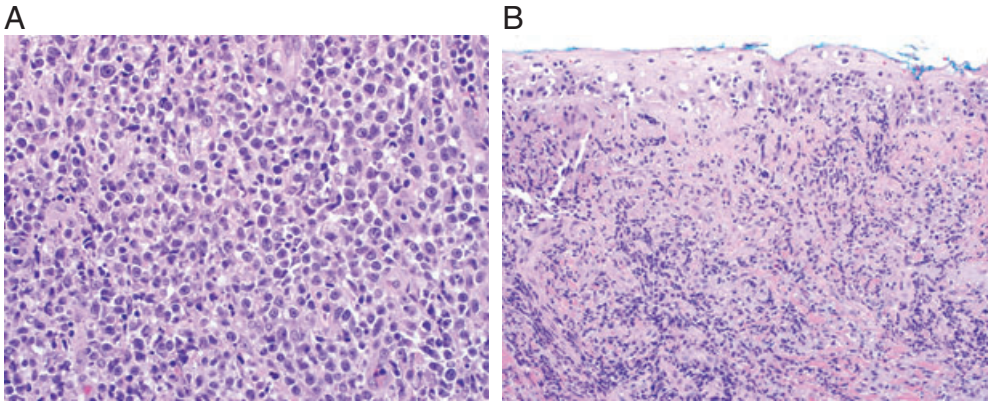

Fig. 6. A punch biopsy (Patient 2) reveals a diffuse dermal infiltrate of large, atypical lymphoid cells (A) that involve the epidermis and form Pautrier collections (B). 400× (A) and 200× (B).

culminating in tumors and large cell transformation, along with the classic histopathologic and immunophenotypic findings and an identical monoclonal T-cell population in distinct anatomic sites, a diagnosis of MF was made. In case 2, the patient had a well-established clinical and pathologic history of MF with tumors and large cell transformation.

To our knowledge, only a handful of CD20-positive MF cases have been previously reported (Table 1). Benner et al. noted four of such cases in a study of prognostic factors in transformed MF.[14] However, detailed clinical, immunophenotypic and genetic information was not provided in this study, and these cases have not been included in the table or summarized below. The remaining patients were described as part of case series,[6,15] case reports,[3,7,12] and a recent study examining CD20 expression in transformed MF.[13] Incorporating the cases presented here, patients with CD20-positive MF include nine males and seven females with an age range of 14–92 years old (Table 1). All cases were positive for CD20, but lacked expression of other B-cell markers, such as PAX5, CD79a, CD19 and/or CD22, where evaluated. In addition, a monoclonal rearrangement of the TCR-γ gene was identified in 14 of 16 cases.

Case 1 also adds to the few reported cases of papular MF,[18] although this patient also demonstrated more conventional lesions with large, thin plaques.

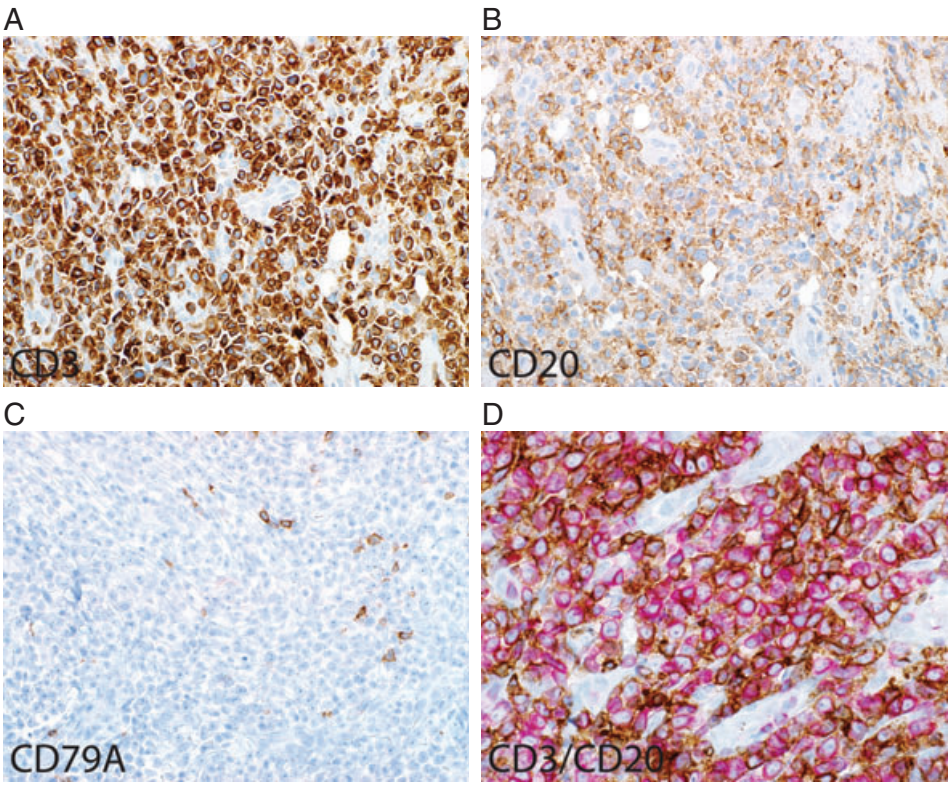

Fig. 7. Atypical lymphoid cells (Patient 2) express CD3 (A, D) and CD20 (B, D), but they do not express CD79a (C). Co-expression of CD3 and CD20 is confirmed on a combined CD3/CD20 immunohistochemical study (D; CD3 in red, CD20 in brown), 400× (A–D).

Notably, all of the reported cases of CD20-positve MF with available clinical information described more conventional lesions (Table 1): patches and ulcerated, thick plaques,[3] two stable plaques,[6] a solitary 3 cm plaque that partially resolved,[15] patches and plaques with a waxing and waning course,[15] crusted nodules representing folliculotropic MF with progression to tumors,[15] and patches and/or plaques that evolved into tumors.[7,12,13] One patient was reported to have multiple skin lesions, but further information about the appearance of these lesions was not provided.[6] For two patients, information regarding the clinical appearance of the lesions was not provided.[13]

The clinical course of disease varied amongst cases of CD20-positive MF (Table 1). However, there was a trend toward tumor formation and large cell transformation, even after exclusion of studies that specifically focused on transformed MF.[13,14] Of the ten patients described in case reports and series that did not focus on transformed MF, six had tumors and/or large cell transformation with five patients developing tumors and four progressing to large cell transformation.[6,7,12,15] Of 13 patients with available clinical information, five patients remained stable or improved. Two patients achieved remission after treatment with topical steroids, PUVA and radiation,[3,7] and one had stable plaques for 15 years.[6] Another patient with a solitary 3 cm patch experienced partial resolution with topical steroids,[15] while a fifth with patches and plaques followed a waxing and waning course.[15] The remaining 11 patients experienced disease progression.[6,12,13,15] Three patients developed nodal disease,[7,13] and four patients expired of their disease.[6,13] Given the limited number of reported cases and follow-up, it is unclear whether CD20 positivity has prognostic significance in MF. Notably, in two large studies on transformed MF, approximately 4% of patients with large cell transformation showed aberrant expression of CD20.[13,14]

The expression of CD20 in an atypical epidermotropic infiltrate might lead to consideration of the diagnosis of B-cell lymphoma, because epidermal lymphocytes have been reported in rare cases of B-cell lymphoma.[19–24] These reported cases of B-cell lymphoma with atypical epidermal lymphocytes were evaluated with at least immunohistochemical studies for B- and T-cell markers, and some were also examined for monoclonal B- and T-cell receptor gene rearrangements. Similarly, nearly all cases of CD20-positive MF reported thus far have been distinguished from B-cell lymphomas due to the lack of other B-cell markers, the presence of T-cell markers such as CD3 and CD4, and the absence of a monoclonal IgH gene rearrangement. Further, in

some cases, co-expression of CD3 and CD20 was confirmed on a dual immunohistochemical study[15] or a dual immunofluorescence study.[13] Finally, in one reported case of CD20-positive MF, flow cytometry was performed on an involved lymph node and revealed a population of T-cells that were positive for CD2, CD3, CD4 and CD5, negative for CD7, and that also expressed CD20.[7] While epidermal involvement by reactive B-cells has also been described,[25] the absence of other B-cell markers in virtually all of the reported cases of CD20-positive MF diminishes the likelihood of a non-neoplastic B-cell population. A full immunophenotypic and genetic evaluation in cases of T-cell lymphoma with aberrant co-expression of CD20 is required to prevent misdiagnosis and inappropriate treatment.

In the cases presented here, the possibility of a CD20-positive reactive or neoplastic B-cell population was considered. However, the similar distribution of the CD20-positive cells and neoplastic T-cells in the epidermis and superficial dermis, the absence of other B-cell markers, and the absence of a monoclonal B-cell receptor gene rearrangement in case 1 helped to exclude a B-cell infiltrate. In case 2, the patient had a well-established history of MF with tumors and large cell transformation, and prior studies had demonstrated an immunophenotypically aberrant, monoclonal T-cell population. Notably, the neoplastic T-cells in the left upper arm biopsy in case 1 showed only partial expression of CD20. While most of the other reported cases of CD20-positive MF displayed uniform expression of CD20, limited CD20 expression by only a subset of neoplastic T-cells has also been described.[6,13,15]

The functionality of CD20 in MF and other T-cell lymphomas is unclear. Two theories have been discussed in the literature. First, CD20-positive T-cell lymphomas may expand from a normal population of T-cells that are dimly CD20-positive.[6,26] Second, it has been postulated that CD20 may represent a marker of activation.[6] In support of the latter hypothesis, CD20 expression can be induced in T-cells in monkey lymph nodes after stimulation by mitogen, IL-2 and simian immunodeficiency virus.[27] In addition, in three cases of CD20-positive MF, CD20 expression appeared over time and correlated with disease progression. In one case, sequential skin biopsies showed a progressive increase in the proportion of neoplastic T-cells coexpressing CD20 and CD30, eventuating in large cell transformation (Table 1, case 4).[6] In a second case, CD20 was expressed by T-cells from a subsequent tumor stage lesion and an involved lymph node, but not from an initial patch/plaque stage lesion (Table 1, case 6).[7] Finally, one of the cases described in this report showed an increasing percentage of CD20-positive and CD30-positive T-cells over time and with disease progression (Table 1, case 1). The role of CD20 in calcium regulation and cellular activation in B-cells lends support to the hypothesis that CD20 is a marker of cellular activation. Moreover, 7 of 16 reported cases of CD20-positive MF also showed co-expression of CD30, the latter a known marker of T- and B-cell activation[28] that may represent an adverse prognostic indicator in MF.[29] Regardless of functionality, CD20 may be a useful antigen for therapy. Anti-CD20 antibody therapy has been used successfully for B-cell lymphomas.[2] In cases of CD20-positive MF refractory to standard therapy, anti-CD20 therapy could also be considered.[6,7,30]

In summary, we report two rare cases of CD20-positive MF. The exact incidence of CD20-positivity in MF is unknown due to variability in the immunophenotypic characterization of MF. In addition, it is unclear whether CD20-positivity may be influenced by the course of disease or medical treatment. To fully understand the clinical and prognostic value of CD20-positivity, more cases and clinical outcomes need to be identified and reported.

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