with regimens used for acute myeloid leukaemia (AML), acute lymphocytic leukaemia (ALL), or aggressive non-Hodgkin lymphoma (NHL) with choice of therapy dictated by local experience. While the majority will achieve some form of response (complete or partial) to initial therapy, most adult patients will relapse.

Retrospective studies have suggested an advantage for ALL-like therapy. The largest study[6] was a retrospective analysis of 43 adults (median age 68 years) diagnosed with BPDCN across 28 Italian centres. Ten of 15 (67%) treated with an ALL- or NHL-like protocol achieved a partial response or better, while 11 of 26 (42%) treated with an AML-like induction regimen achieved partial response or better. The median overall survival was 8.7 months (range 0.2−33 months) with estimated survival rates of 28% and 7% at 12 and 24 months, respectively.

BPDCN is a rare disease treated heterogeneously depending on institutional preferences. Small series that have included patients with only cutaneous disease have reported somewhat better remission rates and a comparable advantage for ALL-like induction therapy. There may be correlation between the maturity of the tumour cells and response to therapy.[7]

Leukaemic manifestation without skin involvement should be distinguished from other leukaemias, the distinction relying heavily on flow cytometric findings. Of note, all of the antigens expressed in BPDCN, including CD4, CD56, and even CD123, can be expressed individually on myeloid or lymphoid leukaemias.

Conflicts of interest and sources of funding: The authors state that there are no conflicts of interest to disclose.

Nicholas Murphy[1], Daniel Owens[2], Emily Hinds[3], Niles Nelson[1]

[1]Department Haematology, Royal Hobart Hospital, Hobart, Tas, Australia; [2]Hobart Pathology, Hobart, Tas, Australia; [3]Special Diagnostics, Department Pathology, Royal Hobart Hospital, Tas, Australia

Contact Nicholas Murphy.
E-mail: nick.murphy@ths.tas.gov.au

1. Chaperot L, Bendriss N, Manches O, *et al*. Identification of a leukemic counterpart of the plasmacytoid dendritic cells. *Blood* 2001; 97: 3210−7.
2. Reizis B, Bunin A, Ghosh HS, *et al*. Plasmacytoid dendritic cells: recent progress and open questions. *Ann Rev Immunol* 2011; 29: 163−83.
3. Swerdlow SH, Campo E, Harris NL, *et al*., editors. *WHO Classification of Tumours of Haematopoietic and Lymphoid Tissues*. Lyon: IARC Press, 2008.
4. Assaf C, Gellrich S, Whittaker S, *et al*. CD56-positive haematological neoplasms of the skin: a multicentre study of the cutaneous lymphoma project group of the European organisation for research and treatment of cancer. *J Clin Pathol* 2007; 60: 981−9.
5. Herling M, Teitell MA, Shen RR, *et al*. TCL1 expression in plasmacytoid dendritic cells (DC2s) and the related $CD4^+$ $CD56^+$ blastic tumors of skin. *Blood* 2003; 101: 5007−9.
6. Pagano L, Valentini CG, Pulsoni A, *et al*. Blastic plasmacytoid dendritic cell neoplasm with leukemic presentation: an Italian multicenter study. *Haematologica* 2013; 98: 239−46.
7. Jaye D, Geigerman CM, Herling M, *et al*. Expression of the plasmacytoid dendritic cell marker BDCA-2 supports a spectrum of maturation among CD4+ CD56+ hematodermic neoplasms. *Mod Pathol* 2006; 19: 1555−62.

DOI: https://doi.org/10.1016/j.pathol.2018.11.016

Initial presentation of acute myeloid leukaemia as collision intradermal melanocytic naevus and myeloid leukaemia cutis mimicking naevoid melanoma

Sir,

We describe a case of a collision between an intradermal melanocytic naevus and myeloid leukaemia cutis (MLC) mimicking naevoid melanoma as the first presentation of acute myeloid leukaemia.

A 67-year-old male had an excisional biopsy of a clinically atypical naevus from the left chest. The lesion was a tan, well circumscribed macule, 7 × 6 mm macroscopically. Histological examination showed an asymmetrical intradermal melanocytic proliferation presenting in nests and sheets and exhibiting maturation with depth. It was composed of type A naevoid cells superficially possessing small nuclei, ample eosinophilic cytoplasm and focal cytoplasmic melanin pigment, and type B naevoid cells in the deeper part of the lesion with smaller nuclei and much less cytoplasm (Fig. 1). Intermingled with this population was a more cellular area composed of sheets of slightly larger cells showing high nuclear to cytoplasmic ratio, hyperchromatic nuclei, inconspicuous nucleoli and easily identifiable mitotic figures (Fig. 1). This second population also exhibited a linear arrangement and layering around dermal vessels and adnexal structures, in a pattern typically seen in congenital naevi. A junctional component was not identified and no epitheliotropism was seen. The primary differential diagnosis included naevoid melanoma. A panel of immunohistochemical stains was performed. S100, SOX10 and HMB45 were expressed in the bland naevoid cells only, with complete absence of staining in the closely associated mitotically active cell population. At this stage it became clear that there was a second non-melanocytic lesion present. Further immunohistochemical stains showed that the non-melanocytic cell population did not stain for cytokeratin AE1/3, CK20 or CK8/18, excluding Merkel cell carcinoma and metastatic carcinoma. The non-melanocytic cells stained weakly for CD45 and did not stain for CD20 or CD3. The Ki-67 index in the mitotically active population was up to 85%, and less than 1% in the melanocytic population. A third immunohistochemical panel showed the non-melanocytic population to stain for CD33, CD4, CD68 and lysozyme. These cells did not stain for myeloperoxidase, CD34, CD2, CD5, CD8, CD43, CD30, CD1a or CD117 (Fig. 1).

Based on the immunohistochemical findings, the lesion was diagnosed as collision intradermal melanocytic naevus and myeloid leukaemia cutis. The treating clinician reported that there were no other cutaneous lesions to biopsy and that a routine full blood examination seven months prior to the excisional biopsy was normal. Following diagnosis, repeat testing showed a mild macrocytic anaemia with anisocytosis (haemoglobin 127g/L, MCV 117 fL), mild thrombocytopaenia (139×10^9/L) and marked monocytosis with abnormal forms (2.2×10^9/L). Examination of a bone marrow aspirate and trephine confirmed the diagnosis of acute myeloid leukaemia (AML) with mutated NPM1 and 45% blasts in the peripheral blood (Fig. 1).

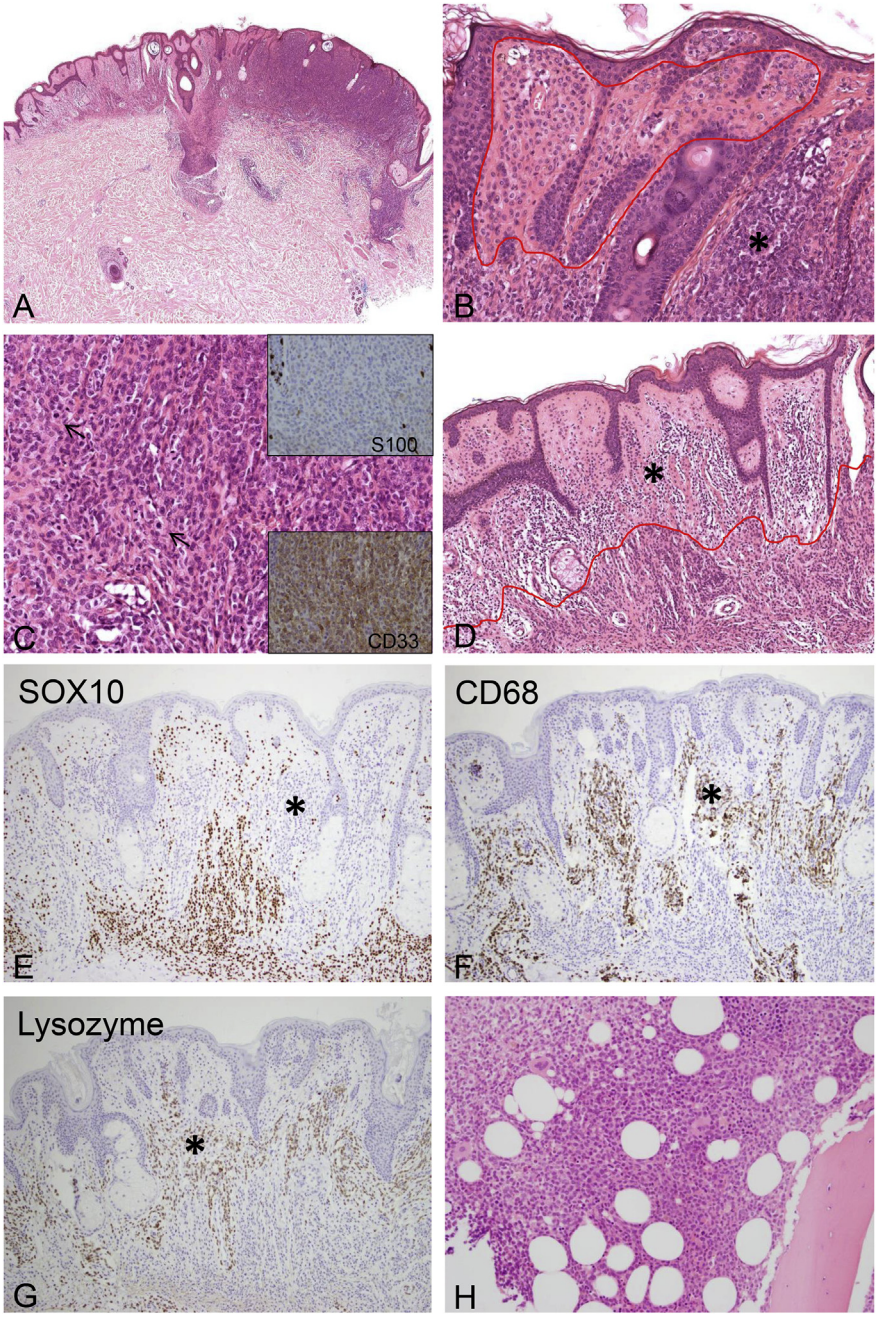

Fig. 1 (A) Low power view of lesion showing more cellular area on the right and less cellular area on the left (H&E). (B) High power view showing the distinctive two cell populations with the naevus cells (enclosed red line) and the leukaemic cells (*) (H&E). (C) High power view of more cellular area on the right in (A) showing a pure population of myeloid blasts with mitotic figures (arrows) (H&E), positive CD33 (inset) and negative S100 (inset). (D) Medium power view showing the naevus cells (below red line) and the leukaemic cells (*) (H&E). (E) SOX 10 positive in the naevus cells and completely negative in the leukaemic cell population (*). (F) CD68 negative naevus cells and CD68 positive leukaemic cells (*). (G) Lysozyme negative naevus cells and lysozyme positive leukaemic cells (*). (H) Bone marrow trephine showing myeloblasts similar to those identified in the skin lesion (H&E).

Leukaemia cutis is defined as cutaneous infiltration by neoplastic leukocytes (myeloid or lymphoid), resulting in clinically identifiable cutaneous lesions. MLC can precede, be concurrent with or occur subsequent to peripheral blood or bone marrow involvement by acute leukaemia.[1] Clinical findings in MLC are non-specific and common findings include papules, nodules and plaques. Rarely these cases present as an erythematous rash, exfoliative erythroderma, urticaria, ulcers or blisters. There is no apparent site of predilection and MLC can be monolesional (as in our case), grouped or disseminated.[2] Histological diagnosis can be difficult due to the varying spectrum of the disease. The pattern of the neoplastic infiltrate can vary from nodular or diffuse cutaneous infiltrates of neoplastic cells to relatively scant perivascular and adnexal infiltrates. Epidermotropism is usually absent.[3] The cytological appearance of the neoplastic cells can vary greatly depending on lineage and degree of cellular maturation. Acute myelomonocytic leukaemia is generally dominated by medium-sized, round or oval-shaped mononuclear cells with eosinophilic cytoplasm and segmented or kidney-shaped basophilic nuclei. Immunohistochemical stains are usually necessary to reach a diagnosis

of MLC. CD68 and lysozyme, although not lineage specific for monocytes/macrophages, were found to be the most sensitive immunohistochemical stains in the detection of MLC in one study, regardless of the French-American-British subtype or transformation from myelodysplastic syndrome.[4]

While the molecular basis of homing to the skin by the myeloblasts in AML has been not completely elucidated, it is believed to be mediated by the interaction of chemokine receptors expressed on myeloblasts and ligands within skin. Some of the myeloid receptors involved in skin homing and retention include CCR5, CXCR4 and CCR2, via interaction with their ligands CCL3, CXCL12 and other unidentified chemokines, respectively.[5] In addition, expression of certain T cell antigens by myeloblasts facilitates skin homing, with expression of CD56, cutaneous leukocyte antigen (CLA) and lymphocyte function-associated antigen-1 all implicated.[6]

In our case the cutaneous myeloblasts were intimately associated with benign dermal naevus cells in a collision lesion. It is most likely that the collision between these tumours is simply a chance occurrence. Given the rare nature of this case, reasons for co-localisation of myeloblasts and naevus cells can only be speculative. Local paracrine effects from the dermal myeloblasts such as fibroblast growth factor (FGF) which is a melanocyte mitogen[7] and which is elevated in leukaemia[8] could have stimulated melanocyte proliferation. On the other hand chemokines secreted by the naevus cells may have resulted in accumulation of the neoplastic myeloblasts. For example, increased numbers of mast cells are typically seen within neurofibromata,[9] indicating that myeloid cells may accumulate within skin tumours.

While Keen previously described a single case of a combined melanoma *in situ* and leukaemia cutis,[10] to our knowledge, our case is the first to describe a collision between a benign intradermal melanocytic naevus and myeloid leukaemia cutis. In our case the histomorphology mimicked naevoid melanoma, but the correct diagnosis was reached using a broad immunohistochemical panel based on high index of suspicion. Further investigations revealed an occult primary haematological malignancy, allowing earlier treatment than would otherwise have been the case.

Conflicts of interest and sources of funding: The authors state that there are no conflicts of interest to disclose.

Laurence Galea, Chin-Guan Tan, Peter I. A. McQuillan, Sant Khan, Christopher Mow

Melbourne Pathology, Melbourne, Vic, Australia

Contact Dr Laurence Galea.
E-mail: laurence.galea@mps.com.au

1. Bénet C, Gomez A, Aguilar C, *et al*. Histologic and immunohistologic characterization of skin localization of myeloid disorders: a study of 173 cases. *Am J Clin Pathol* 2011; 135: 278–90.
2. Wagner G, Fenchel K, Back W, *et al*. Leukemia cutis – epidemiology, clinical presentation, and differential diagnoses. *J Dtsch Dermatol Ges* 2012; 10: 27–36.
3. Buechner SA, Li CY, Su WP. Leukemia cutis. A histologic study of 42 cases. *Am J Dermatopathol* 1985; 7: 109.
4. Cibull TL, Thomas AB, O'Malley DP, *et al*. Myeloid leukemia cutis: a histologic and immunohistochemical review. *J Cutan Pathol* 2008; 25: 180–5.
5. Faaij CM, Willemze AJ, Révész T, *et al*. Chemokine/chemokine receptor interactions in extramedullary leukemia of the skin in childgood AML: differential roles for CCR2, CCR5, CXCR4 and CXCR7. *Pediatr Blood Cancer* 2010; 55: 344–8.
6. Bakst RL, Tallman MS, Douer D, *et al*. How I treat extramedullary acute myeloid leukemia. *Blood* 2001; 118: 3785–93.
7. Halaban R, Fan B, Ahn J, *et al*. Growth factors, receptor kinases, and protein tyrosine phosphatases in normal and malignant melanocytes. *J Immunother* 1992; 12: 154–61.
8. Ribatti D, Vacca A, Rusnati M, *et al*. The discovery of basic fibroblast growth factor/fibroblast growth factor-2 and its role in haematological malignancies. *Cytokine Growth Factor Rev* 2007; 18: 327–34.
9. Giorno R, Lieber J, Claman HN. Ultrastructural evidence for mast cell activation in a case of neurofibromatosis. *Neurofibromatosis* 1989; 2: 35–41.
10. Keen CE. Combined skin lesions. *Am J Dermatopathol* 1996; 18: 527–32.

DOI: https://doi.org/10.1016/j.pathol.2019.01.005

Pulmonary epithelial myoepithelial carcinoma with papillary architecture: an uncommon morphology of a rare tumour

Sir,

Epithelial myoepithelial carcinoma (EMC) is a rare primary tumour of the submucosal bronchial glands. The literature encompasses only case reports of this entity from across the world. The common morphological patterns reported are those with tubules, glands or solid areas. Papillary architecture in EMC is rare. We present a rare case of EMC with papillary architecture.

A 50-year-old woman presented with chest pain and dyspnoea on exertion of 1-year duration along with occasional cough with haemoptysis. She had a background history of exposure to indoor smoke from a cooking stove ('chulha') for the previous 20 years. X-ray of the chest revealed patchy opacities in both lung fields and consolidation of the right paracardiac region. A contrast enhanced computed tomography scan (CECT) of the thorax showed a 2.6 × 1.9 cm soft tissue lesion at the right hilum (Fig. 1A) leading to blockage of the right middle lobe bronchus resulting in collapse and consolidation of right middle lobe. Fibre-optic bronchoscopy was performed, and biopsies were obtained which were diagnosed as EMC. The patient underwent a right lobectomy. The post-operative period was uneventful.

The lobectomy specimen revealed a 3.5 × 1.8 × 1.5 cm endobronchial tumour (Fig. 1B) with a greyish-white cut surface. Microscopically the sections showed an intraluminal proliferating tumour exhibiting a biphasic architecture comprising complex glandular architecture along with well-formed papillae (50% of each component) (Fig. 2A–F). There were focal areas with clear cell and oncocytic change also. The tubules/glands contained eosinophilic intraluminal secretions and were lined with a bilayer of inner epithelial and outer myoepithelial cells. The epithelial cells were cuboidal with eosinophilic cytoplasm and stained immunohistochemically (IHC) with cytokeratin CK7 (Fig. 2G). The myoepithelial cells were clear cells and exhibited positivity for P-40 (Fig. 2H), smooth muscle actin (SMA) (Fig. 2I) and S-100. Both the epithelial and myoepithelial cells were negative for thyroid transcription factor (TTF) 1. Focal