Auer rods in polymorphs in a case of acute myeloid leukemia

Sir,

Auer rods are crystalline inclusions, pathognomic of myeloid differentiation of the leukemic blasts. Their presence in maturing myeloid cells and monocytes is rare. They have primarily been described in patients with acute promyelocytic leukemia (APL) and other French-American-British (FAB) subtypes of acute myeloid leukemia (AML), namely AML- M1, M2 and M4. We would like to document a case of AML-M2 with eosinophilia, where numerous polymorphs showed presence of Auer rods.

A 10-year-old male, born of nonconsanguineous marriage, presented to us with high-grade fever, loss of appetite and generalized weakness of 10 day's duration. Physical examination revealed moderate pallor and presence of submandibular lymph node measuring approximately 2 cm in maximum dimension. Complete hemogram showed hemoglobin of 73 g/L, total leucocyte count of 10.3×10^9/L, platelet count of 29×10^9/L and smear examination revealed 16% blasts, some of which contained Auer rods. Bone marrow aspiration smears were cellular and showed approximately 53% blasts, along with maturing myeloid series of cells and 8% eosinophils. Auer rods were noted in some of the neutrophils and myelocytes [Figure 1]. In addition, significant dysplasia was noted in the mature myeloid cells in the form of Pseudo–Pelger–Huet anomaly and hypogranulation [Figure 1]. On flow cytometry, theses blasts were positive for CD34, CD117, HLA-DR, CD13, cMPO and also showed aberrant expression of CD19. Interestingly these cells were negative for CD33. Hence, a final diagnosis of AML with maturation (FAB AML-M2 with eosinophilia) was proposed. Conventional cytogenetics showed a normal male karyotype, however molecular analysis using reverse transcription-polymerase chain reaction revealed AML1-ETO, (t[8;21]) fusion product.

Auer bodies are rod-shaped crystalline inclusions formed of azurophilic granules, named after John Auer, though they were first recognized by Thomas McCrae.[1] Based on the electron microscopic finding way back in 1977, it was concluded that the formation of Auer rods is due to defects in the formation, aggregation, and concentration of the peroxidase granules in the leukemic blasts.[2] Auer rods in neutrophils are a rare finding and their presence in

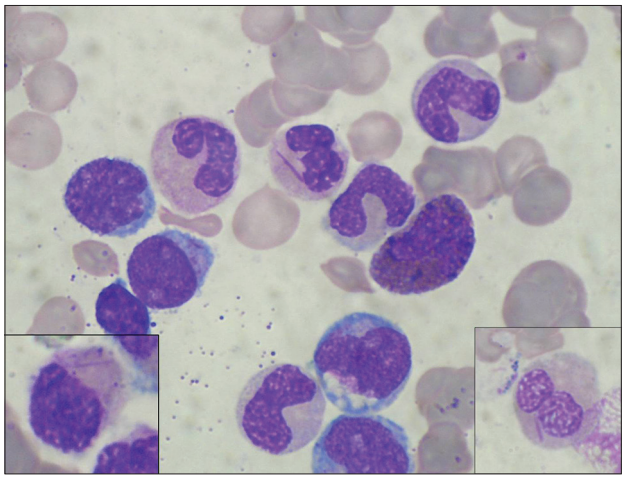

Figure 1: May–Grunwald–Giemsa stained bone marrow aspiration smear showing Auer rod in neutrophil; inset showing a hypogranular and hypolobated neutrophil and myelocyte containing Auer rod

Table 1: Brief summary of the cases documented in literature showing Auer rods, in cells other than blasts

Author, year	Number of cases	Type of cell showing Auer rods	Other morphological features	Immunophenotype/ cytogenetics
Davies and Schmitt[3]	1	Neutrophils		ND
Stass *et al.*,[4]	10	Neutrophils	Correlate with AML-M2	ND
Kato *et al.*,[5]	1	Neutrophils	Correlate with AML	ND
Kanoh *et al.*,[6]	1	Neutrophils and monocytes	Peudo–Pelger–Huet	ND
Ashihara *et al.*,[7]	1	Neutrophils	Correlate with AML-M3 (APML)	t (15;17)
Anand *et al.*,[8]	1	Neutrophils		ND
Kallel *et al.*,[9]	1	Neutrophils	MDS transforming to AML	t (8;21)
Dawson and Whitehead[10]	1	Neutrophils		Normal karyotype
Guérin *et al.*,[11]	1	Neutrophils	Dysplasia (hypogranular, Pseudo–Pelger–Huet)	Complex karyotype
Ohnishi *et al.*,[12]	1	Neutrophils and metamyelocytes	Correlate with AML-M1	Trisomy 4
Dmitrienko and Vercauteren[13]	1	Neutrophils	Dysplastic	Mixed lineage (T/ myeloid) with normal karyotype
Manish *et al.*	1	Neutrophils	Pseudo-pelger huet anomaly	AML with aberrant CD19 and AML1-ETO fusion product

ND: Not done, AML: Acute myeloid leukemia, MDS: Myelodysplastic syndrome, APML: Acute promyelocytic leukemia

neutrophils is suggestive of nucleo-cytoplasmic asynchrony; where the nuclear maturation has occurred, however, the cytoplasmic granule content is similar to that of immature myeloid cells.[2] A brief review of the literature has shown 11 case reports[3-13] where authors have documented the presence of Auer rods in neutrophils, myelocytes, and rarely in monocytes [Table 1]. Majority of these cases belonged to the FAB AML-M2 and M3 category though occasional cases of AML-M1 and myelodysplastic syndrome have also been reported. In cases of APL, it was observed by the authors that Auer rods positive neutrophils were increased in patients after remission induction in pre all-trans-retinoic acid era.[7]

In the present case, Auer rods are found in neutrophils, and some of the neutrophils also showed Pseudo–Pelger–Huet anomaly and hypogranulation; features of dysplasia. Morphologically the index case belonged to FAB AML-M2 with eosinophilia category. Further on flow cytometry these blasts showed aberrant expression of CD19. Expression of CD19, bright co-expression of CD34 and dim/absent expression of CD33, have been shown to have high positive predictive value for t (8;21).[14]

Overall, in conclusion, the presence of Auer rods is supposed to be associated with a good prognosis. Their presence in neutrophils and cells other than blasts clearly point that these cells are part of a malignant clone; however; their role in long-term clinical implications and diagnostic significance is still unclear. Moreover, their presence is not associated with any specific cytogenetic abnormality.

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