



# Bone marrow ring sideroblasts in hematological diseases: an analysis of consecutive 1300 samples in a single institution

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## Abstract

The incidence of MDS-RS in Japan has been recognized as about 5% which is lower than that in European countries. Insufficient use of iron staining tests in Japan has been noted as one conceivable factor contributing to this apparently lower prevalence. To investigate this issue, we analyzed the proportion of ring sideroblasts (RS) in 1300 bone marrow samples from patients with hematological diseases at Kitasato University Hospital, including iron staining of all samples. Sixteen of 96 patients with MDS (16.7%) were diagnosed with MDS-RS, and this accounted for 26.2% of MDS without excess blasts. Some MDS-EB (22.9%) and AML-MRC (13.8%) patients also had  $\geq 15\%$  RS. In contrast, RS were rarely found in myeloid neoplasms without dysplasia and non-myeloid diseases: only 1 in 46 (2.2%) patients with AML without dysplasia, 2 in 93 (2.2%) with MPN, and 8 in 984 (0.8%) with non-myeloid diseases had  $\geq 5\%$  RS. These results indicate that prevalence of MDS-RS in Japan may be higher than conventionally recognized and that RS are principally restricted to myelodysplastic disorders. Further multicenter studies using consecutive bone marrow samples with iron staining tests will be required to confirm our findings.

**Keywords** Myelodysplastic syndrome (MDS) · Ring sideroblast (RS) · MDS-RS · Iron staining test

## Introduction

Myelodysplastic syndrome (MDS) is a clonal hematopoietic disorder characterized by ineffective hematopoiesis with various degrees of cytopenias and bone marrow dysplasia, and a risk of progression to acute myeloid leukemia (AML) [1]. MDS with ring sideroblasts (MDS-RS) is an entity characterized by accumulation of abnormal ring sideroblasts (RS) [2, 3]. MDS-RS is clinically characterized by better prognosis and better response to luspatercept, a recombinant protein that binds TGF- $\beta$  superfamily ligands and reduces SMAD signals [4–6], and, therefore, appropriate laboratory examinations for RS, i.e. iron staining tests, and an accurate

diagnosis of MDS-RS are clinically very important for the treatment of MDS.

The incidence of MDS-RS in Japan has been described as  $\sim 5\%$  [7–11], which is lower than that, i.e. 10–15% [9, 12–14], in European countries. However, because available epidemiological data on the prevalence of MDS-RS are limited in Japan and there are anecdotes that iron staining tests might be substantially overlooked in Japan, the incidence of MDS-RS in Japan might be underestimated. Therefore, reviewing bone marrow samples on which iron staining tests were completely conducted will have great clinical importance.

In our hospital, we have performed iron staining tests on all bone marrow samples, which enabled us to analyze consecutive data on the frequency of RS in all hematological diseases that needed bone marrow examinations including MDS. Therefore, in this study, we reviewed our bone marrow samples, and investigated the status of RS and the incidence of MDS-RS in our cases, and we estimated the probable prevalence of MDS-RS in the Japanese population. In addition, as we have performed iron staining tests on all bone marrow samples with hematological

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