Case Report

DOI: 10.7860/JCDR/2026/82797.22676

Pathology Section

Myeloid Sarcoma: A Series of Five Cases from a Tertiary Care Centre in Tamil Nadu, India

D SARANYA[1], S PREETHA[2], P VIJAYABASKAR[3], S GOMATHI[4], P VINODHINI[5]

ABSTRACT

Myeloid Sarcoma (MS) constitutes a rare extramedullary manifestation characterised by the clonal proliferation of myeloid precursor cells. It may present in association with Acute Myeloid Leukaemia (AML), Myelodysplastic Syndromes (MDS), or Myeloproliferative Neoplasms (MPN), or as an isolated entity. Its variable morphology and frequent absence of a prior haematological history present a significant diagnostic challenge. This report delineates five cases of MS diagnosed at our tertiary care centre between July 2023 and June 2025. All patients were male, with a median age of 36 years. Affected anatomical sites included soft tissue (n=2), bone (n=1), lymph node (n=1), and testis (n=1). Two patients had an underlying diagnosis of Chronic Myeloid Leukaemia (CML). Histopathological evaluation consistently revealed blastic morphology, often closely mimicking lymphoma or small round cell tumours. Immunohistochemistry (IHC) proved indispensable for definitive diagnosis, with all cases demonstrating positivity for CD34 and Myeloperoxidase (MPO). Notably, one case also exhibited CD99 and FLI-1 expression, thereby creating diagnostic overlap with Ewing sarcoma. This case series highlights the diverse presentations and inherent diagnostic pitfalls of MS, emphasising the importance of considering MS in the differential diagnosis of extramedullary masses and employing judicious IHC, particularly MPO and CD34, to ensure accurate diagnosis.

Keywords: CD34, Chronic myeloid leukaemia, Diagnostic challenges, FLI-1, Histopathological diagnosis, Immunohistochemistry, Myeloperoxidase, Myeloid sarcoma

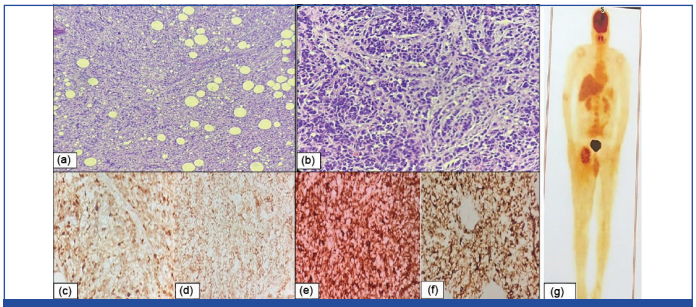
INTRODUCTION

The MS is defined as a tumour mass composed of myeloblasts or immature myeloid precursors that manifests in extramedullary locations. While commonly observed in the skin, lymph nodes, and bone, its occurrence can extend to less common anatomical sites, such as the genitourinary tract, gastrointestinal tract [1], and central nervous system [2]. This condition, historically referred to as chloroma due to its occasional greenish hue caused by MPO, represents a critical diagnostic entity due to its often aggressive behaviour and association with underlying haematological malignancies. MS may arise de novo (primary or isolated MS) without concurrent bone marrow involvement, or in association with acute leukaemia, MDS, or MPN [3]. Clinical suspicion for MS frequently remains low, as its symptomatic presentation typically stems from mass effect and organ infiltration, often in the absence of the classical systemic features associated with leukaemia. This non-specific presentation means that patients often initially consult with specialists outside of haematology, further contributing to diagnostic delays [1]. The accurate and timely identification of MS is paramount, as its presence has significant implications for patient prognosis and requires specific therapeutic strategies. This paper presents five unusual cases of MS, illuminating the substantial diagnostic challenges and inherent pitfalls associated with this rare entity, and emphasising the crucial role of advanced diagnostic techniques. It is a two-year retrospective study conducted in the Institute of Pathology, Madras Medical College, from July 2023 to June 2025. All MS cases reported during the study period were included. Case details were retrieved from the department archives along with histopathology slides stained with Haematoxylin and Eosin; IHC slides were reviewed again, and the details were documented.

CASE SERIES

Case 1

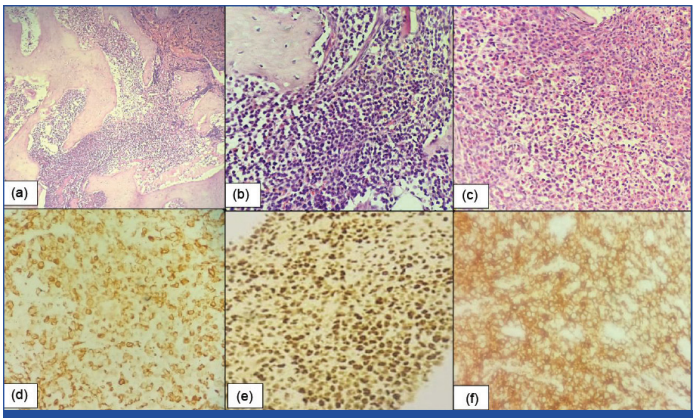
A 36-year-old male presented with a painless, rapidly increasing right inguinal mass for two months, accompanied by intermittent high-grade fever with chills and rigour for five days. On examination, swelling was 6x6 cm in size, hard, and not mobile. Radiological assessment by CT and MRI suggested evolving abscess or soft-tissue sarcoma or metastatic lymphadenopathy, requiring a biopsy. Histological examination of the mass revealed diffuse sheets of large blastoid cells with irregular nuclear membranes exhibiting distinct plasmacytoid morphology, raising a broad differential of poorly differentiated carcinoma, melanoma and lymphoma. IHC ultimately confirmed the diagnosis of MS, demonstrating diffuse positivity for CD45, MPO, CD34, and CD117, which are characteristic markers for myeloid precursors and stem cells. Ki-67 was 80% highlighting the increased proliferative index [Table/Fig-1]. The patient was then subjected to bone marrow studies and a Positron Emission Tomography (PET) scan for staging evaluation. Bone marrow aspiration and biopsy revealed trilineage haematopoiesis with no increase in blast cells. IHC in trephine biopsy demonstrated 3% positivity of CD34 and 70% for CD33. PET-CT of the whole body revealed the absence of metabolically active inguinal, iliac and retroperitoneal nodes and anywhere else in the body. He underwent chemotherapy and radiotherapy and was doing well on a three-month follow-up [Table/Fig-1].



[Table/Fig-1]: a,b) Blastoid morphology of tumour cells (H&E; a-10x, b-40x). c) Ki67 showing proliferative index of 80% (IHC, 10x); d) Diffuse positivity for CD117 (IHC, 10x); e) Diffuse cytoplasmic expression of MPO (IHC, 10x); and f) Strong diffuse positivity for CD34 (IHC, 10x); g) PET-CT scan image shows no metabolically active uptake in marrow.

Case 2

A 13-year-old male presented with pain and gradually increasing swelling in the medial end of the clavicle of 4×4 cm for six months, an atypical site for this age group. Upon evaluation, X-ray revealed a lytic lesion and MRI demonstrated a lytic lesion with soft-tissue involvement. No other swelling in the body was detected. An initial biopsy showed skeletal muscle bundles infiltrated with inflammatory cells composed of neutrophils, eosinophils and lymphocytes, hence suggesting an inflammatory lesion, which delayed definitive diagnosis. Swelling persistently increased in size; therefore, a subsequent biopsy was done, which displayed prominent blastoid cells with significant crush artefact, a common histological challenge, obscuring cell morphology. Presence of blastoid cells having scant cytoplasm, vesicular nuclei with other inflammatory cells mainly eosinophils, neutrophils and plasmacytoid cells infiltrating the skeletal muscle leads us to the histopathological differential diagnoses of Ewing sarcoma and high-grade lymphoma for the age. CD99, CD45 and FLI-1 specific to the initial differentials were added. Surprisingly, all three markers were diffusely positive. Though the possibility of Ewing sarcoma was strongly favoured, CD45-positive blastoid cells raised a strong suspicion of haematolymphoid malignancy. The initial lymphoid IHC panel was negative; a further panel of MPO, CD34, and CD117 showed diffuse strong positivity. The co-expression of CD99 and FLI-1, typical of Ewing sarcoma, initially created a diagnostic dilemma, but the strong positivity for MPO, CD117 and CD34 definitively confirmed the myeloid lineage [Table/Fig-2]. Subsequent bone marrow studies revealed no increase in blasts. The patient underwent chemotherapy. Follow-up with PET-CT after two cycles of chemotherapy revealed a favourable response to treatment.



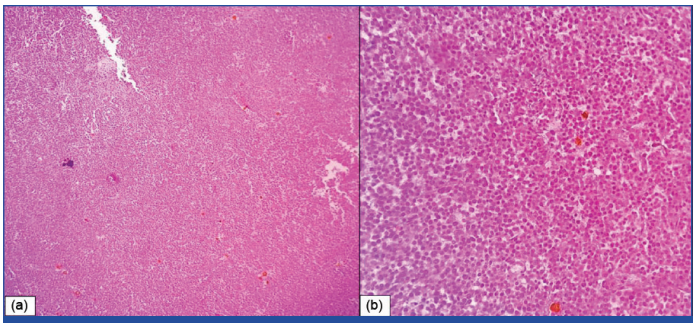
[Table/Fig-2]: a) Small blue round cells with crush artefact (H&E, 10x); b) Cells with blastoid morphology (H&E, 40x); c) Eosinophilic myelocytes (H&E, 40x); d) Diffuse Positive Expression of membranous CD99 (IHC, 40x); e) Strong diffuse nuclear FLI 1 expression (IHC, 40x); and f) Diffuse membranous positivity for CD34 (IHC, 40x).

Case 3

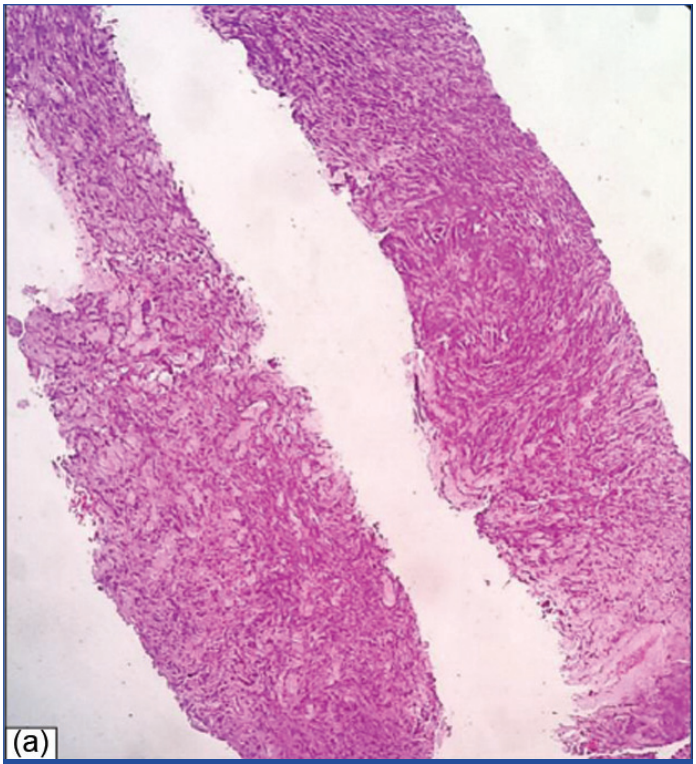
A 43-year-old male presented with right supraclavicular swelling, generalised lymphadenopathy and bilateral pleural effusion. Imaging revealed multiple bone lytic lesions, resulting in a clinical suspicion of lymphoma or multiple myeloma. Peripheral smear, bone marrow aspiration and biopsy performed concurrently revealed CML in chronic phase, establishing an underlying haematological neoplasm. Histomorphology of supraclavicular swelling showed infiltrative neoplastic cells with blastoid morphology, which was confirmed by IHC positivity for CD34 and MPO with a negative panel of CD3, CD20, CD138, TdT, CD117, and CD1a. Patient expired after induction chemotherapy, which explains the aggressive nature of MS in the context of known CML [Table/Fig-3].

Case 4

A 44-year-old male, with a documented history of CML in chronic phase and a record of treatment non-compliance, presented with a right anterior chest wall mass of 5×4 cm and fever for one day. Radiological findings revealed a soft-tissue lesion involving the right sternoclavicular joint, 1st rib and intermuscular plane. Peripheral smear and bone marrow examination subsequently confirmed a blast phase with a blast percentage of 77% indicating a progression of his underlying CML. Subsequently, Fine needle aspiration cytology of the anterior chest wall swelling was reported as suspicious of malignancy. Histological analysis of the chest wall mass showing blastoid cell morphology and IHC (positive for CD34 and MPO) corroborated the diagnosis of MS, indicating the chest wall mass was a manifestation of myeloid blast transformation. Patient expired within two months of defaulted treatment, highlighting the poor prognosis associated with MS arising in the context of CML blast crisis [Table/Fig-4].



[Table/Fig-3]: a) Small blue round cells (H&E,10x); b) Cells with blastoid morphology (H&E, 40x).



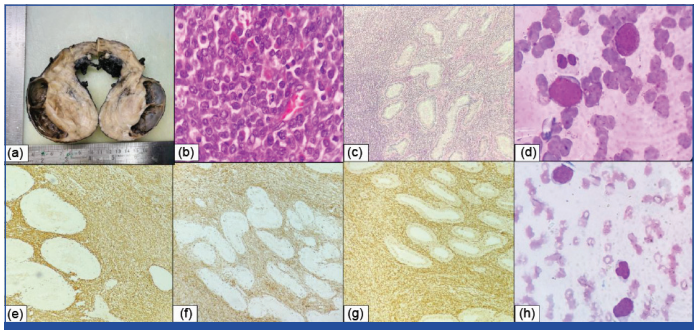
[Table/Fig-4]: a) Core biopsy from anterior chest wall swelling: Small blue round cells (H&E, 10x).

Case 5

A 28-year-old male presented with a history of one month of swelling of the left testis. Serum Lactate Dehydrogenase (LDH) levels were increased: 365.5 units/L, while AFP and beta-HCG were within normal limits. The possibility of a germ cell tumour was considered. However, serum markers were not helpful. MRI investigation suggested either primary testicular malignancy or lymphoma. A high inguinal orchidectomy was performed, revealing an infiltrative tumour in the testis of size 7.5×4×3.2 cm. Histomorphology showed sheets of neoplastic cells involving the interstitium, compressing the seminiferous tubules and infiltrating the rete testis, epididymis, and spermatic cord. Histomorphological diagnosis favoured haematolymphoid malignancy, so, lymphoma IHC panel was added. High Ki-67 with a negative lymphoma panel

necessitated an extended IHC workup that confirmed MS with IHC CD34, CD117, MPO, and CD45 positivity. Patient completed induction chemotherapy and defaulted. Expired in five months post-diagnosis, further illustrating the aggressive course of this disease, particularly when presenting in rare, primary sites [Table/Fig-5].

[Table/Fig-6] highlights the consolidated details of all five cases with follow-up details.



[Table/Fig-5]: a) Macroscopic image of the testicular mass; b) Sheets of neoplastic cells seen compressing the seminiferous tubules (H&E, B-40x); c) Epididymis shows tumour infiltration (H&E,10x); d) Tumour cells express membranous positivity for CD45 (IHC,10x); e) Tumour cells express membranous positivity for CD99 (IHC, 10x); and f) Tumour cells express membranous positivity for CD34 (IHC,10x); g,h) Peripheral smear showing blast cells with markedly reduced platelets (oil immersion, 100x).

Case no.	Age/ sex	Site	History/ bone marrow	IHC findings	Outcome
1	36/M	Inguinal region	No marrow involvement	CD45+, CD34+, MPO+, CD117+, Vimentin+; **Negative**: PanCK, HMB45, CD3, CD20, TdT	Received RT+ CT; Alive (3-month follow-up)
2	13/M	Clavicle (medial end)	No marrow involvement	CD45+, MPO+, CD34+, FLI-1+, CD99+, Vimentin+; **Negative**:CD3, CD20, PanCK, CD138	Chemotherapy; Alive (15-month follow-up)
3	43/M	Supra clavicular node	CML–Chronic phase	CD34+, CD79a (10%+); **Negative**:CD3, CD20, CD138, TdT, CD117, CD1a	Expired during induction chemotherapy
4	44/M	Anterior Chest wall mass	CML–Blast crisis	CD34+, MPO+	Expired within 2 months (treatment defaulter)
5	28/M	Testis	No marrow involvement at diagnosis; developed acute leukaemia later	CD45+, CD34+, MPO+, CD117+, CD99+; **Negative**: CD3, CD20, CD79a, CD30, ALK, PLAP, Oct3/4, inhibin, synaptophysin, desmin, S100, FLI-1	Expired within 5 months (induction chemotherapy given, defaulted)

[Table/Fig-6]: Consolidated details of cases of Myeloid Sarcoma (MS).

DISCUSSION

The incidence of MS in adults and paediatric age groups is 2 and 0.7 out of 1 million, respectively [4,5]. The diagnosis of MS presents considerable complexities owing to its wide spectrum of morphological appearances; this often necessitates the careful exclusion of other malignancies, including lymphoma, poorly differentiated carcinoma, blastic plasmacytoid dendritic cell neoplasm, and various small round cell tumours, all of which can share a common blastoid or undifferentiated histological appearance [6]. The inherent challenge lies in differentiating these entities based solely on routine H&E staining, which frequently proves insufficient.

Frequency of extramedullary organ involvement in MS reported in the literature includes skin, lymph node, soft tissue and bone [7]. This present study had two cases of soft-tissue, one case each in bone and lymph node, and a rare presentation of testicular MS. Testicular involvement is exceedingly rare and has been the subject of systematic reviews and case reports emphasising diagnostic and therapeutic considerations unique to that site [8-10].

The median age at diagnosis differs among various case series in the literature being 29, 42 and 11 years; this present study revealed a median age of 36 years with all being male, whereas study conducted by Murugan R et al., showed an equal male to female ratio [11], while studies by Abedi A et al., and Bala S et al., showed similar male predominance [7,12]. The rate of misdiagnosis is high, with an incidence of 25 to 47% as per Magdy M et al., [13].

IHC is an indispensable modality in establishing an accurate diagnosis, with CD34 (a hematopoietic stem cell marker) and MPO (a specific myeloid enzyme) consistently serving as the most reliable and specific markers for MS [14]. However, a comprehensive panel is often required; for instance, lymphoid markers (e.g., CD3, CD20, PAX5) are vital to exclude lymphoma, while epithelial markers (e.g., cytokeratins) are essential to rule out carcinoma.

Case 1 showed blastoid morphology along with expression of CD45 causing initial confusion; however, it was confirmed as MS with positivity for myeloid lineage markers. The aberrant expression of CD99 and FLI-1 as observed in our Case 2 can cause significant diagnostic confusion, particularly with Ewing sarcoma, attributable to overlapping immunophenotypes [15,16]. In such instances, the demonstration of strong MPO positivity becomes the critical distinguishing factor, guiding the diagnosis towards MS despite the presence of typical non-myeloid markers [15]. Monoblastic variants and other uncommon morphological subtypes have been reported and can further complicate the diagnostic pathway [17].

Testicular MS, as exemplified by Case 5, represents an exceedingly rare presentation, which further compounds the diagnostic challenge due to its strong resemblance to more common testicular tumours, such as germ cell tumours or lymphomas, both clinically and radiologically [8-10]. Similarly, the clavicular MS in a 13-year-old patient (Case 2) posed substantial diagnostic difficulty due to the presence of crush artefact within the biopsy specimen. Such artefacts can distort cellular morphology, making accurate pathological assessment challenging and potentially leading to a misleading initial immunoprofile that suggests Ewing sarcoma. This highlights the need for high-quality tissue samples and careful correlation with clinical presentation [12].

Our series also encompasses two cases (Case 3 and Case 4) that originated in patients with a pre-existing history of CML, thereby highlighting the established association of MS with disease progression or blast crisis in individuals with underlying MPNs. The emergence of MS in CML patients signifies an acceleration of the disease, often leading to a more aggressive clinical course and poorer prognosis, necessitating a rapid escalation of therapeutic intervention [18,19].

Although molecular studies, including cytogenetics, Fluorescence In Situ Hybridisation (FISH), and next-generation sequencing, are progressively advocated for the comprehensive genetic characterisation and prognostic stratification of MS, their execution was not feasible at our institution owing to resource limitations during the period of patient diagnosis. These advanced techniques can reveal specific recurrent genetic abnormalities that not only confirm the myeloid lineage but also provide valuable prognostic information and identify potential targets for novel therapies [20].

Collectively, our observations highlight the critical importance of employing a comprehensive primary immunohistochemical panel, particularly in overcoming the diagnostic ambiguity characteristic of MS's varied presentations. Furthermore, a meticulous and thorough

correlation of immunohistochemical findings with the patient's clinical history and radiological presentations is paramount to avert misdiagnosis, facilitate timely intervention, and ultimately improve patient outcomes in the context of this challenging disease.

CONCLUSION(S)

The MS consistently presents a significant diagnostic challenge, primarily attributable to its diverse and frequently atypical clinical presentations, which often mimic other malignancies. Consequently, an enhanced awareness of its varied manifestations, coupled with the judicious application of comprehensive immunohistochemical panels and meticulous correlation with clinical history, is unequivocally crucial for achieving timely and accurate diagnosis. Such an approach is a prerequisite for effective patient management and may contribute to improving the grim prognosis often associated with this elusive disorder.

REFERENCES

[1] Kheirkhah P, Avila-Rodriguez AM, Radzik B, Murga-Zamalloa C, Gastrointestinal myeloid sarcoma a case presentation and review of the literature. Mediterr J Hematol Infect Dis. 2021;13(1):e2021067. Doi: 10.4084/MJHID.2021.067.

[2] Hermassi MA, Ghedira K, Bouzouita K, Zehani A, Bouali S, Abderrahmen K. Cerebral myeloid sarcoma (Chloroma): Report of a rare entity. Int J Surg Case Rep. 2025;129:111233. Doi: 10.1016/j.ijscr.2025.111233.

[3] Aldapt MB, Soliman DS, Haddad F, Abuasab T, Abbas F, Mosalem O, et al, Myeloid sarcoma in myelodysplastic syndrome: Review. Blood. 2022;140(1):12333-34. doi.org/10.1182/blood-2022-163324.

[4] Movassaghian M, Brunner AM, Blonquist TM, Sadrzadeh H, Bhatia A, Perry AM, et al. Presentation and outcomes among patients with isolated myeloid sarcoma: A Surveillance, Epidemiology, and End Results database analysis. Leuk Lymphoma. 2015;56(6):1698-703, Doi: 10.3109/10428194.2014.963080.

[5] Yilmaz AF, Saydam G, Sahin F, Baran Y. Granulocytic sarcoma: A systematic review. Am J Blood Res. 2013;3:265-70.

[6] Mundada MC, Ahmed F, Kodandapani S, Gundimeda S, Boyella P, Patil V, et al, Myeloid sarcoma: A 7-year retrospective study from a tertiary cancer care center, illustrating the clinical, morphological, and immunohistochemical features, Asian J Oncol. 2024:10;12. Doi: 10.25259/ASJO_35_2023.

[7] Abedi A, Namdari N, Monabati A, Safaei A, Rajabi P, Mokhtari M. Myeloid sarcoma: Case series with unusual locations. Int J Hematol Oncol Stem Cell Res. 2023;17(4):296-303.

[8] Sahu KK, Sherif AA, Mishra AK, Lal A, Singh A. Testicular myeloid sarcoma: A systematic review of the literature. Clin Lymphoma Myeloma Leuk. 2019;19(10):603-18, Doi: 10.1016/j.clml.2019.04.013.

[9] Miller S, Jeberaeel J, Saad A, Abd Almohsen N, Vaishampayan N. Pediatric myeloid sarcoma of the testes treated with surgery and adjuvant radiation therapy. Cureus, 2024;16(3):e57029. Doi:10.7759/cureus.57029.

[10] Dharshini RPP, Peter SB, Chengalvarayan G, Kalpana S. An unusual testicular mass: Myeloid sarcoma as a rare extramedullary manifestation of acute myeloid leukaemia. Egypt J Radiol Nucl Med. 2024;55(1):64.

[11] Murugan R, Sharan KC, Srinivas BH, Basu D, Kar R, Jinkala SR, et al. Myeloid sarcoma: Experience from a tertiary care center in southern India - A series of eight unusual cases. Indian J Pathol Microbiol. 2025;68(1):113-17.

[12] Bala S, Kumar A, Ravina M, Dange P, Kashyap Y. Myeloid sarcoma cases with varied presentations leading to diagnostic delay: A case series. J Hematol Allied Sci. 2023;3:29-33.

[13] Magdy M, Abdel Karim N, Eldessouki I, Gaber O, Rahouma M, Ghareeb M. Myeloid sarcoma. Oncol Res Treat. 2019;42(4):224-29.

[14] Pileri SA, Ascani S, Cox MC, Campidelli C, Bacci F, Piccioli M, et al, Myeloid sarcoma: Clinico-pathologic, phenotypic and cytogenetic analysis of 92 adult patients. Leukaemia. 2007;21(2):340-50. Doi: 10.1038/sj.leu.2404491.

[15] Vaikari VP, Jang M, Akhtari M, Alachkar H. CD99 is highly expressed in Acute Myeloid Leukaemia (AML) and presents a viable therapeutic target. Blood. 2016;128(22):1540.

[16] Kornblau SM, Qiu YH, Zhang N, Singh N, Faderl S, Ferrajoli A, et al. Abnormal expression of FLI1 protein is an adverse prognostic factor in acute myeloid leukaemia. Blood. 2011;118(20):5604-12.

[17] Kaushik N, Kumar L, Agarwal P, Kumar H, Sharma B. Monoblastic sarcoma- A rare case report of myeloid sarcoma variant. J Clin Diagn Res. 2021;15(11):XD01-03.

[18] Arzoun H, Srinivasan M, Thangaraj SR, Thomas SS, Mohammed L. The progression of chronic myeloid leukaemia to myeloid sarcoma: A systematic review. Cureus. 2022;14(1):e21077.

[19] Szymczyk A, Podhorecka M, Tomczak W, Szumiło J, Hus M. Myeloid sarcoma associated with blast crisis in chronic myelogenous leukaemia – Case report. J Pre-Clin Clin Res. 2016;10(2):136-39.

[20] Greenland NY, Van Ziffle JA, Liu Y-C, Qi Z, Prakash S, Wang L. Genomic analysis in myeloid sarcoma and comparison with paired acute myeloid leukaemia, Hum Pathol. 2021;108:76-83. Doi: 10.1016.

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Institute of Pathology, Madras Medical College and RGGGH, Chennai, Tamil Nadu, India.
2. Assistant Professor, Institute of Pathology, Madras Medical College and RGGGH, Chennai, Tamil Nadu, India.
3. Assistant Professor, Institute of Pathology, Madras Medical College and RGGGH, Chennai, Tamil Nadu, India.
4. Professor, Institute of Pathology, Madras Medical College and RGGGH, Chennai, Tamil Nadu, India.
5. Postgraduate Student, Institute of Pathology, Madras Medical College and RGGGH, Chennai, Tamil Nadu, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. S Preetha,
2E4, Block 2, Arihant Esta Apartments, Church Road, Mogappair East,
Chennai-600037, Tamil Nadu, India.
E-mail: drpreetha88264@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Sep 23, 2025
- Manual Googling: Dec 14, 2025
- iThenticate Software: Dec 16, 2025 (3%)

ETYMOLOGY: Author Origin

EMENDATIONS: 6

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Aug 31, 2025**
Date of Peer Review: **Oct 15, 2025**
Date of Acceptance: **Dec 18, 2025**
Date of Publishing: **Mar 01, 2026**