



# Renal transplantation in marrow dysfunction: A case series

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**Abstract:** This abstract presents a case series of renal transplants in three patients with aplastic anemia, a rare hematological disorder characterized by bone marrow failure and pancytopenia. We conducted a retrospective analysis of these patients, focusing on their demographic data, clinical characteristics, transplant procedures, and post-transplant outcomes. Special attention was given to immunosuppression management and potential complications related to both conditions. Our literature review revealed only one previously published case report, highlighting the rarity of this clinical scenario. This case series aims to contribute insights into the unique challenges and considerations associated with renal transplantation in aplastic anemia patients. We discuss transplant outcomes, including graft function, patient survival, and complications. The study underscores the importance of a multidisciplinary approach in managing complex patients with both hematological and renal disorders and emphasizes the need for further research to establish evidence-based guidelines for such cases.

**Keywords:** Renal Transplant; bone marrow dysfunction; hematopoietic dysfunction; chronic kidney disease; hemodialysis

**Citation:** Rajarajan T. Renal transplantation in marrow dysfunction: A case series. *Kauverian Med J*, 2024;1(12):27-35.

Academic Editor: Dr. Venkita S. Suresh

ISSN: 2584-1572 (Online)

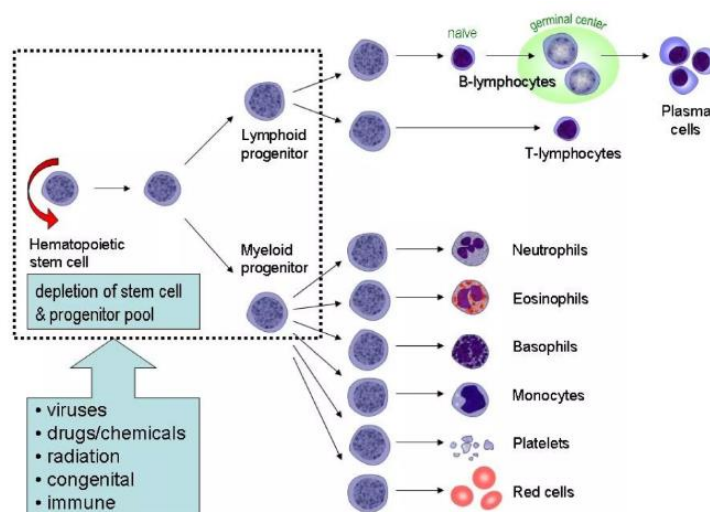


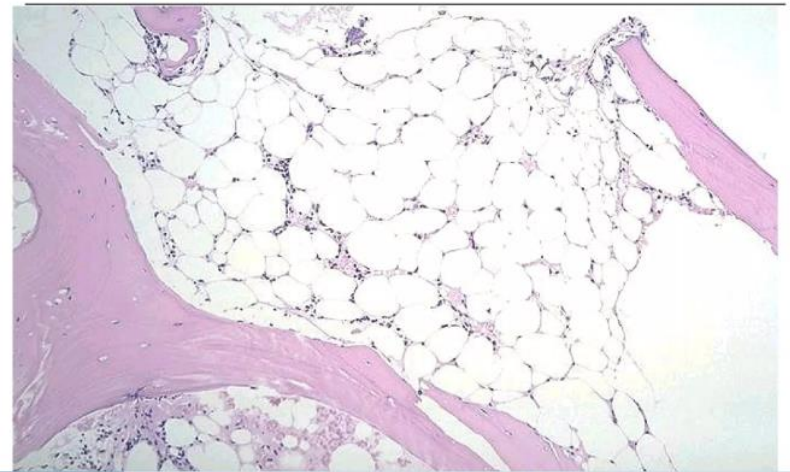
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## 1. Introduction

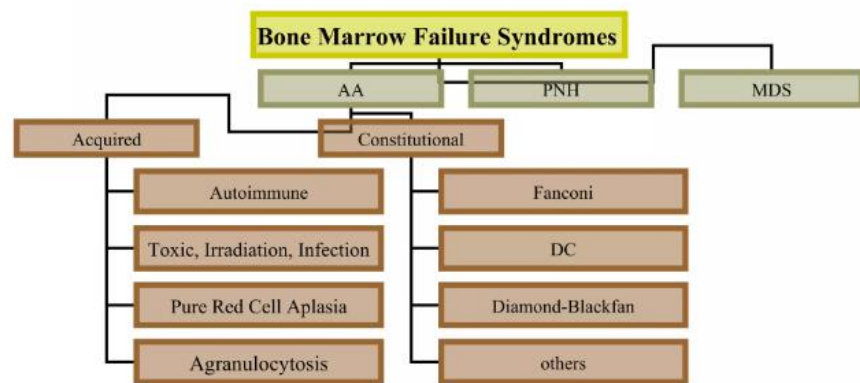
### Bone marrow failure (BMF)

Decreased production of one or more major hematopoietic lineages leads to diminished or absent hematopoietic precursors in the bone marrow and attendant cytopenias.



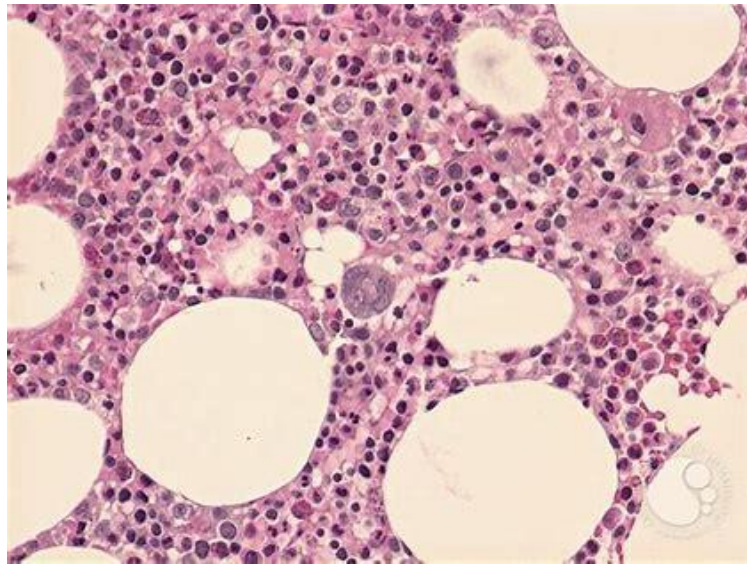


## Bone Marrow Failure Syndromes



CAUSES	Cytotoxic drugs Radiation Benzene	Idiopathic Seronegative hepatitis Eosinophilic fasciitis Thymoma	Telomere disease Fanconi anemia Other germline gene mutations
PATHOPHYSIOLOGY	Chemical and physical damage	Immune destruction	Constitutional genetic defects
PATHOLOGY			
TREATMENTS	Supportive care Hematopoietic growth factors Hematopoietic stem-cell transplantation	Immunosuppressive therapy Hematopoietic stem-cell transplantation Eltrombopag	Sex hormones Hematopoietic stem-cell transplantation

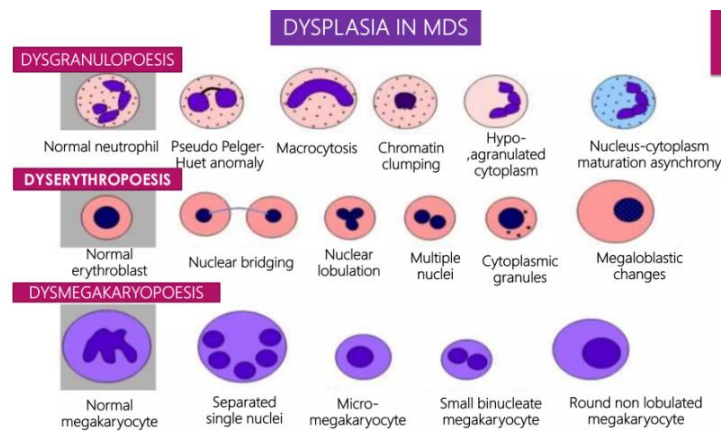
### Normal BM



### Aplastic BM



### Dysplasia in MDS



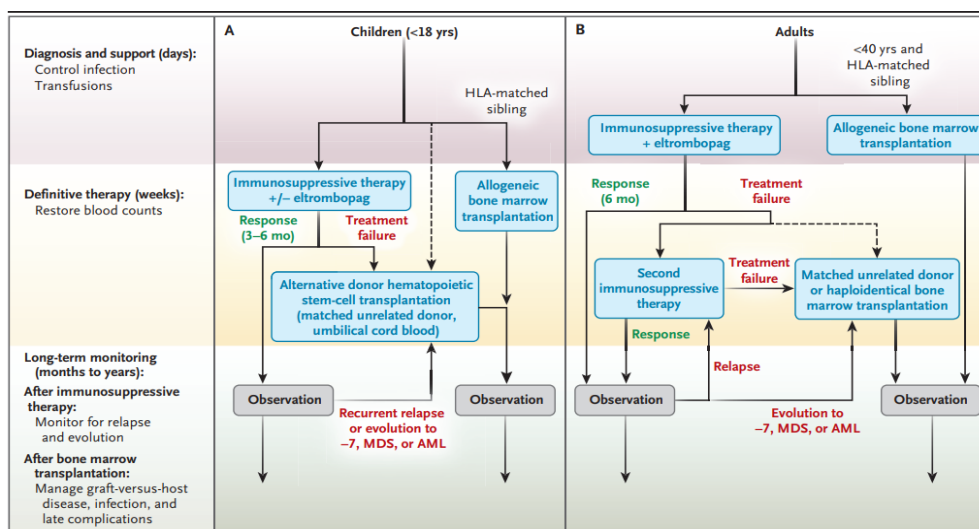
CYTOGENETIC ABNORMALITIES AND THEIR ASSOCIATIONS IN MDS	
Cytogenetic abnormality	Associated with
Del 5q	Good prognosis in elderly patients with thrombocytosis and macrocytic anemia
Del 7q	Differentiates hypocellular MDS from aplastic anemia
Monosomy 7	Pediatric MDS-25% cases demonstrate it, JMML (MDS/MPN)
Del 11q	Intermediate risk
Del 17p	Dysgranulopoiesis, pseudo-Pelger-Huet anomaly with small vacuolated neutrophils and TP53 mutation, and poor response to therapy
Monosomy 5	MDS-EB
Del 12p	CMML
Trisomy 8	MDS-RS & CMML
11q23	Secondary/therapy related MDS

**Prognosis of aplastic anaemia depends**

1. Severity of disease based on absolute neutrophil count
  - a. Non severe: >500
  - b. Severe: 200-500
  - c. More severe: <200
2. Age at diagnosis and start of treatment.
  - a. Older the age and delay in treatment
3. Cause of aplastic anaemia.
  - a. Cytogenetic abnormalities

### Severity of AA

- 2 of 3 peripheral blood count criteria
- 2. ANC < 500 /μL
- 3. Plat count < 20 000 /μL
- 4. Retics (Automated) < 60 000 /μL



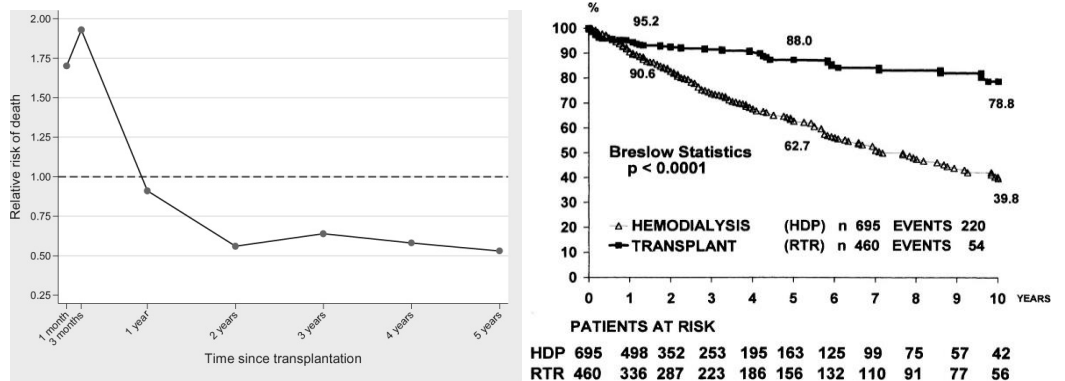
**Prognosis**

With current BMT regimen, most patients with severe aplastic anemia have a 60-70% long-term survival rate

Patients with severe aplastic anemia who receive antithymocytic globulin (ATG) or antilymphocyte globulin (ALG) but do not receive BMT have a 41% response rate and a 1-year survival rate of 55.4%. Adding androgens increases response rates to 70%, with a 1-year survival rate of 76%.

Cyclosporine therapy at 200-400 mg/dl (Maintain serum trough levels at 100-250 nb/ml) has a reported 85% hematologic remission rate.

**Survival of dialysis vs transplant**



**2. Case Presentation**

**2.1. Case 1**

A 37-year-old male patient came with the following complaints. ESRD (End-Stage Renal Disease) on HD NKD (no kidney disease). Underwent live related renal transplant - Aug 2016, elsewhere mother donor. On steroid, free protocol then noted a Progressive graft dysfunction. Incisional hernia in 2020 for that Mesh hernioplasty done followed by HD started 2021 December.

On routine evaluation on 23-11-2021

1. Hb: 5.8 g/dl; TLC: 2900; DC: N - 65.3%; L: 24.2%; M: 7.4%; E: 2.4%
2. Platelet: 143000
3. Vitamin B12 and folate levels were normal.

**Bone marrow aspiration 23-11-21**

1. Marrow is hypocellular.
2. Cellularity in hypocellular area -15%. Megakaryocytes- nil erythroid and myeloid series –unremarkable.No increase inreticulin fibres.NO granuloma,immature precursors.
3. Chromosome analysis: 46 XY.

**Diagnosis**

Non-severe Aplastic anaemia

**Prognosis: Good**

1. No cytogenetic abnormalities
2. Non severe aplastic anaemia
3. No dysplasia or immature precursors

**Treatment given**

Drug	Dose	Frequency
Danazol	100 mg	1-0-1
Eltrombopag	100 mg	1-0-0

Attained clinical response as evidenced by;

**Discussion**

Points in favour of renal transplant

- 1) Non-severe aplastic anemia with good long-term prognosis
- 2) Consistent improvement in Blood counts.
- 3) Non-requirement of transfusion, infections or bleeding diathesis
- 4) Proceeded with renal transplant as patient and family members are keen in renal transplant, as he was not doing well with dialysis.

Donor spouse: 29/f B+

HLA: Haplomatch; DSA: Negative; PRA: Negative; CM: Negative.

**Pre OP counts**

Hb: 9.6; TLC: 4400; N: 60 %; Platelets: 2.63 lakhs

Renal transplant on 15-8-2022

Induction: ATLG (Anti-T-Lymphocyte Globulin)

Immunosuppression: Tacrolimus (TAC)/Mycophenolate mofeti (MMF)/Steroids

- 1) L lap donor nephrectomy
- 2) Single renal vessels
- 3) Left renal bed

**Therapeutic dilemmas***Induction agent*

ATLG vs Basiliximab

- 1) ATG is set to be an immunosuppressive agent in treating aplastic anemia.
- 2) ATLG quite similar to ATG given in view of cost constraints

*Maintenance immunosuppression*

- 1) Tacrolimus/MMF/steroids vs Tacrolimus/Everolimus/steroids
- 2) In view of stable counts, High-risk transplant decided to go with Tac/mmf/steroids. Outcome was good.

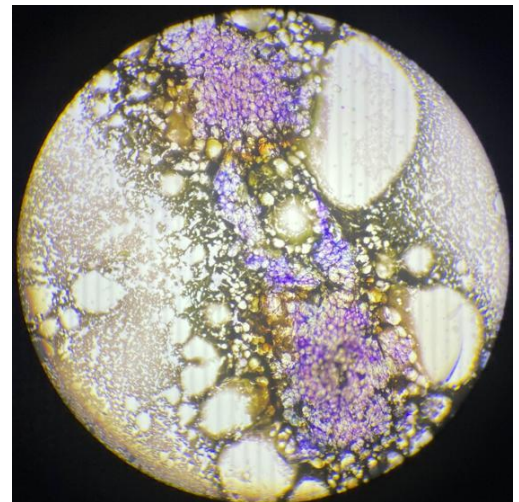
**Discharge**

Danzol was stopped and Eltrombopag continued for 1-month post-transplant.

- 1) Hb:9.6; TLC: 6700; Platelet - 2.63
- 2) Sr. creatinine: 0.96

Last, follow up

- 1) Hb :13.5 TLC 7200 Plat : 1.9 lakhs
- 2) Sr. creatinine - 0.86



2.2. Case 2

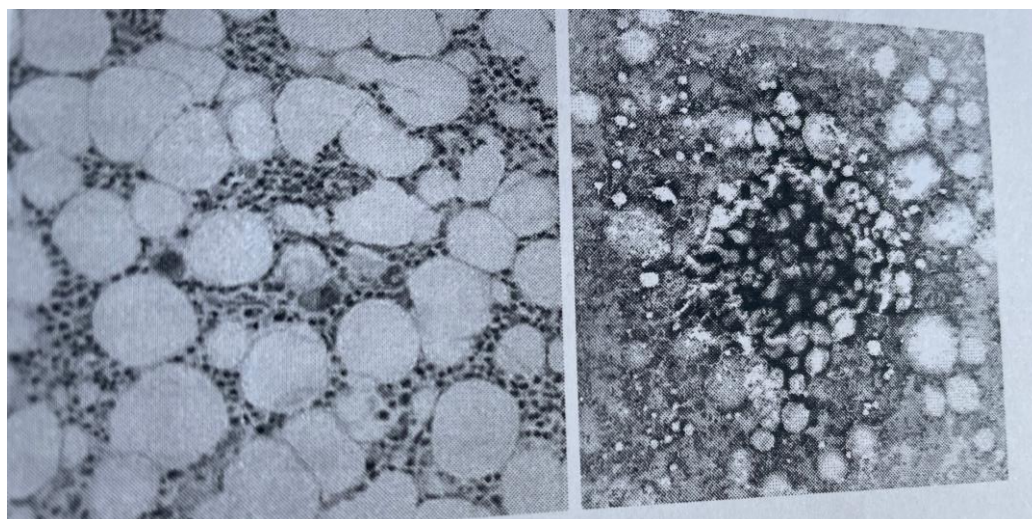
A 42-year-old male patient came with the following complaints, CKD diagnosed 2020 and HD was inducted in Jan 2020, elsewhere. Started on transplant work up elsewhere. Lab: Hb - 8.3; TLC – 2000; DLC - 50%; Platelet - 1.74.

**BONE MARROW TEST REPORT**

**BONE MARROW ASPIRATION WITH TREPINE BIOPSY**

**IMPRESSION :**

**Hypocellular marrow with no evidence of dyspoiesis or atypical cells. Marrow hypocellularity may only represent an evolving aplasia in view of preserved megakaryopoiesis. Direct toxic injury (by native medicines) causing myelosuppression may be the contributing factor.**



Cytogenetics: No abnormality detected

Started on Danazol/Eltrombopag/Erythropoietin.

Date	Hb	TLC	N %	Platelets
10-10-21	9.6	3200	62	1.74
21-12-21	9.8	2800	65	1.9
5-4-22	7.9	3100	64	2.25

**Proceeded for renal transplant**

Due to stable ANC (Absolute Neutrophil Count)

1. Non requirement of blood transfusion,
2. Absence of infection and bleeding diathesis
3. Normal cytogenetics which all portends favourable prognosis

Donor: Paternal aunty - 67 years

HLA: 3/6 match

CDC CM: Negative

Screening PRA Class II - Weak positive

PRA by SAB Class I is 19% (Max MFI 1200)

Class II - 0%

**Renal transplant on 8-9-22**

**Induction:** not given due to low normal counts for fear of infection

**Immunosuppression:** TAC/MMF/Steroids.

Date	Hb	TLC	PMN	Platelet
9-9-22	8.9	14700	72%	3.61
13-9-22	8.2	12700	68%	2.78
27-10-22	11.2	6100	74.9%	1.56
26-8-23	15.3	7400	73.2%	2,01

Discharge: Sr. creatinine - 1.4

Follow up 20-8-23: 1.49 - urine routine; Normal BP - 120/80

2.3. Case 3

A 29 years old Male 0+ patient came with the following complaints like Chronic IgA nephropathy-2017. June 2022- ESRD -HD induced.

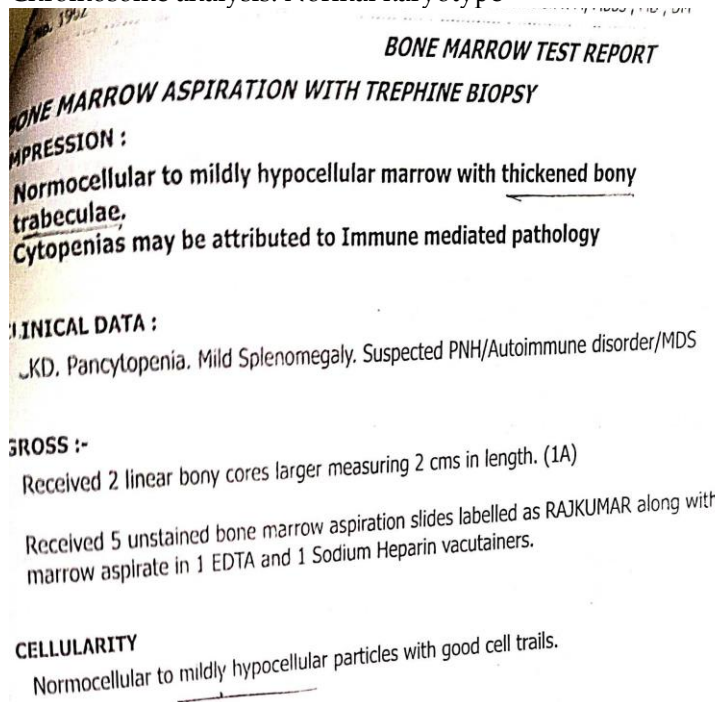
Transplant workup - mother donor-0+

Immunological workup – satisfactory. On April 2023 - Developed pancytopenia.

Lab: Hb -6.9 gm% TC 2400 Platelet - 1.16 lakhs

**Bone Marrow Report**

Chromosome analysis: Normal karyotype



Then managed with Danazol and erythropoeitin.

Before the renal transplant in Jan 2024,

**Lab:** Hb - 9.7gm/dl, TLC - 3100, Platelet count - 1.81 lakhs.

Renal transplant on 20-1-24

**Induction:** Basiliximab

**Immunosuppression:** Tac/MMF/Steroids

Uneventful postoperative period.

**Discharge**

1. Sr. Creatinine: 1.2 mg/dl

2. Hb 10.2 gm/dl : TLC - 4500 Platelet - 1.6 lakhs

Follow up September 2024

1. Sr. Creatinine: 1.2 mg/dl

2. Hb 14.5 gm/dl; TLC – 7600; Platelet - 1.8 Lakhs

Determinants for safe renal transplant in aplastic anaemia



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<b>Favourable factors</b>	<b>Unfavourable factors</b>
Non severe aplastic anaemia, Consistent response following treatment for a minimum 3 months, Normal cytogenetics.	Severe Aplastic anaemia requiring transfusions, Persistent platelet count < 1 lakh, Persistent neutropenia, Myelodysplasia, Abnormal cytogenetics, Inherited bone marrow failure syndromes.

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Points learned from those 3 cases

1. Renal transplant can safely be done in non severe aplastic anemia.
2. Maintenance immunosuppression can safely maintain remission of aplastic anaemia.
3. Antimetabolites can safely be used without the danger of fall in counts.
4. Proper evaluation of aplastic anaemia can safely include and exclude the patients for renal transplant.