

The Cologne criteria was used in this study for staging of IMF which showed that 10% of patients were stage I, 15% stage II,

40% stage III and 35% stage IV. Bone marrow biopsy finding at different stage of IMF is shown in table 7.

Table 7: BMB finding at different stages of IMF (one way ANOVA)

	Stage I	Stage II	Stage III	Stage IV	P value
Hemopoietic tissue	92.68	80.06	49.31	41.10	<0.05
Fatty tissue	3.81	7.79	9.24	16.92	<0.05
Fibrous tissue	7.32	33.67	44.58	49.06	<0.05
TBW	80.03	102.12	116.88	119.35	<0.05
MKC	35.62	37.15	45.91	49.36	<0.001
OBI	0.612	0.635	0.676	0.789	<0.05
BV	3025.5	3712.3	4059.6	4300.8	<0.05

Discussion

A better understanding of the myeloproliferative process and prognosis of IMF patients can be obtained through study of how this disease is expressed in the bone marrow. In this study both subjective and quantitative evaluation of bone marrow trephine biopsies was performed correlating the findings with the amount of iron pigment, reticulin fibrosis and staging of the disease.

The majority of cases showed hemopoietic hypercellularity rather than hypocellularity, a result similar to that of Varki et al, 1983^[18]. Many of the megakaryocytes showed morphologic abnormalities as those described by other studies^[19,20]. These abnormalities include bizarre nuclear configuration, most of the cells show hypo segmented nuclei while few megakaryocytes have hyper segmented nuclei^[19,20].

A significant degree of marrow fibrosis was recognized in most patients (73.34%) which is higher than that reported earlier by Varki et al, 1983^[18], but lower than the figure reported by Jalal (1988) who found that all cases showed marked degree of fibrosis^[21].

The semi quantitative evaluation of marrow iron stores revealed the presence of depleted iron stores in 33.34% of patients, presumably because of secondary iron deficiency due to blood loss either resulting from the presence of extramedullary hemopoietic foci leading to peptic ulcer^[22]

or due to platelet dysfunction, acquired factor V deficiency, thrombocytopenia and DIC^[23].

The quantitative evaluation of bone marrow biopsies showed that IMF patients have lower mean values of hemopoietic tissue and fatty tissue and by higher mean values of fibrous tissue; trabecular bone width, OBI, MKC concentration, and blood vessels (p value < 0.001). Similar findings were described by Frisch et al, (1985), who also described the correlation between the degree of reticulin fibrosis and quantitative evaluation of BMB^[17]. He proved that the mean value of hemopoietic tissue volume is reduced with increasing amount of reticulin fibrosis, while the mean values of fatty tissue volume, fibrous tissue volume, MKC concentration, OBI, TBW & blood vessels tend to correlate with the degree and reticulin fibrosis^[17]. Our study also proves these findings, which were very highly significant statistically.

The number and character of reticulin fibers vary considerably^[10]. In sections with abundant hemopoietic cells, there is only a slight-moderate increase in reticulin while in areas with markedly reduced hemopoietic tissue, greatly thickened, more abundant and highly intertwining bundles of reticulin fibers are recognized^[10].

We also showed that clusters of megakaryocytes are usually present and may be the only recognizable hemopoietic cells in areas of dense fibrosis. This finding