

Thrombocytopenia and Coagulopathy Following Hepatic Cryoablation

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Background

Cryoablation for primary or metastatic liver lesions is performed with increasing frequency [1]. There are several hematologic and biochemical derangements following hepatic cryoablation some of which are fatal. Thrombocytopenia and coagulopathy are prominent hematologic abnormalities described in literature [2].

Methods

We conducted a retrospective record review of hepatic cryoablation procedures at the Karmanos cancer center (KCC), Interventional Radiology unit. For those patients who had severe thrombocytopenia and coagulopathy, more detailed information on laboratory data and outcome was collected and summarized.

Results

A total of 194 hepatic cryoablation procedures were performed on 127 patients. Indications for cryoablation were colorectal cancer in 47 (37%) and hepatocellular carcinoma 23 (18%) non-colon metastasis in 57 (45%), around 90% of the patients had platelet count of $\geq 100,000/\text{mm}^3$ at baseline. Platelet count dropped by more than 50% from baseline in 20% of the cryoablation procedures. Six patients had severe thrombocytopenia with platelet count of $\leq 20,000/\text{mm}^3$ following cryoablation (Table 1). All six patients required care in the intensive care unit and had clinical feature consistent with disseminated intravascular coagulation (DIC) like picture with thrombocytopenia, low fibrinogen, elevated D-dimer, prolonged partial thromboplastin time (aPTT) and prolonged prothrombin time (PT). Two of the six patients died of multi-organ failure.

Discussion

The observations in this retrospective study showed thrombocytopenia as a common complication following hepatic cryoablation with significant drop in platelet count (by $>50\%$ from baseline) occurring in 20% of the procedures. The study also showed severe thrombocytopenia with platelet drop to $\leq 20,000/\text{mm}^3$ in six patients (0.04%) which is less common compared to previous studies. However, all of the studies were retrospective with wide range of observations [3].

Table 1: Laboratory values and outcome for 6 patients with post cryoablation platelet drop of $20,000/\text{mm}^3$ or less.

Patient	Baseline platelet count k/mm^3	Post procedure platelet count (nadir)	Baseline PT/PTT in seconds	Post procedure PT/PTT (highest)	Lowest Post Procedure Fibrinogen (mg/dl)	Highest Post Procedure D-dimer(mg/L)	MICU Stay (days)	Outcome
1	160	9	12.2/37.9	16.2/37.9	130	>92	10	discharged
2	225	10	10.3/32.4	20.7/32.4	346	>92	9	discharged
3	77	17	10.7/28.6	20/40	57	22.93	20	died
4	204	9	10.1/28	19.5/29.3	58	10.01	4	discharged
5	213	10	10.4/25.2	13.1/NA	95	28.45	13	discharged
6	121	12	NA/NA	33.5/34.6	88	NA	5	died

NA: Not available.

Normal laboratory reference values:

PT (prothrombin time): 9.1-11.9 sec; PTT (partial thromboplastin time): 23-34 sec; Fibrinogen: 180-462 mg/dl; D-dimer: < 2.78 mg/dl.

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A unique complication of hepatic cryoablation is multi-organ failure, severe coagulopathy and DIC termed as cryo-shock phenomena [4]. Similar complication was seen in six patients in this retrospective review with fatal outcome in two. Possible pathophysiology of such systemic catastrophe following hepatic cryoablation is thought to be the result of pro-inflammatory cytokine release including phospholipase A2, IL-6 and TNF-alpha from cryoablation induced tissue injury [5,6].

Conclusion

Thrombocytopenia is a common complication following hepatic cryoablation. Although unusual, DIC with fatal outcome is occasionally seen. We recommend prospective study to understand the mechanism and explore interventions that can help prevent adverse outcome.

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