Yellow phosphorus poisoning: is preemptive PLEX therapy feasible?

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We read with great interest the "hub and spoke" model developed in Tamil Nadu, India to treat patients with acute liver failure caused by yellow phosphorus (YP) ingestion. The referral chain starts with primary health centres for assessment and resuscitation and ends with district government medical college hospitals for plasma exchange (PLEX) for those who meet specific criteria so that PLEX potentially serves as a more cost-effective option compared to liver transplantation.[1] This indeed is a success of the academic community which generated the data and receptivity of the local government which facilitated implementation of the program as well as imposing a partial ban on the poison. It is quite reassuring to note that the hub and spoke model of PLEX therapy has reduced mortality. Preliminary data on survival of those fulfilling King's College Hospital Criteria (KCHC) for liver transplantation is exciting, but warrants further exploration.[2,3] We had published our data on Acute Liver Failure (ALF) due to Ratol Poisoning where those fulfilling KCHC could be taken off the transplant list with PLEX therapy.[3] We had shown that after PLEX, both groups of patients, those who fulfilled KCHC and those who did not, showed significant improvement in liver function tests, with 100% survival in the latter group. Among those who fulfilled the KCHC Criteria, 35% survived without transplant.[3] Another study done in Vellore had shown that low-volume PLEX, demonstrated promising results in children with YP poisoning, with 75% (6 out of 8 children) survival in those who met the Kochi listing criteria for urgent liver transplantation.[4]

In ALF and Acute on Chronic Liver Failure (ACLF) macromolecules including Von Willebrand Factor (vWF) levels are markedly elevated, which correlates with organ failure and predicts in-hospital mortality.[5] The removal of these macromolecules by PLEX results in better prognosis and better in-hospital survival. In patients with rodenticide-induced hepatotoxicity, there is a similar relationship between high Von Willebrand Factor (vWF) levels, mortality and multi-organ failure.[6] The study also reported the outcome of a management protocol involving the use of N-acetyl cysteine (NAC), fresh frozen plasma (FFP) infusions, and PLEX all of which resulted in better survival.[6]

We would like to present a different viewpoint to initiate PLEX at an earlier stage, considering YP poisoning as a systemic disease and the fallacy of keeping liver dysfunction at the center to formulate therapeutic decisions. Due to rapid distribution systemically in 2–3 h, the poison accumulates predominantly in the liver (69–73%), heart (12%), kidneys (4%), and smaller quantities (<1%) in the pancreas, spleen, brain and other organs.[7] There have been instances of post-transplant course getting complicated by the presence of poison circulating in blood; post-transplant graft dysfunction has been documented.[8] We had reported a case of severe pancreatitis complicating post liver transplant course.[9] Considering these facts, it is worthwhile embarking on pre-emptive PLEX therapy, which is PLEX therapy at an earlier stage, well before liver transplant criteria are fulfilled (King's College Criteria or Kochi Criteria[6]). LFT abnormality either lobular or cholestatic with evidence of liver cell failure with elevated INR may be taken up for PLEX therapy; additional markers including vWF levels may be considered. This would reduce mortality, reduce the need for liver transplant intervention, reduce post-transplant complications and reduce extrahepatic toxic effects as well. Further studies are warranted to decide on biochemical cut-off points to embark on pre-emptive PLEX therapy. A concern regarding pre-emptive PLEX would be removal of molecules which are beneficial, especially coagulation factors. Replacement fluid being a mix up of fresh frozen plasma, 20% human albumin, this is taken care of to some extent.

In summary, instead of the current management algorithms of rodenticide poisoning keeping liver at the centre for therapeutic decision-making and liver transplant intervention as the therapeutic modality, we would suggest pre-emptive PLEX therapy considering the systemic nature of the poisoning. Further studies are warranted to decide on the molecular markers and the criteria to initiate PLEX at an earlier stage.

Contributors

Amal Joseph–Writing—original draft, Literature Review.
Harikumar Nair–Conceptualisation, Writing–review & editing.

Declaration of interests

None to declare.

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