Treatment of methotrexate toxicity with conventional hemodialysis: a pediatric case series

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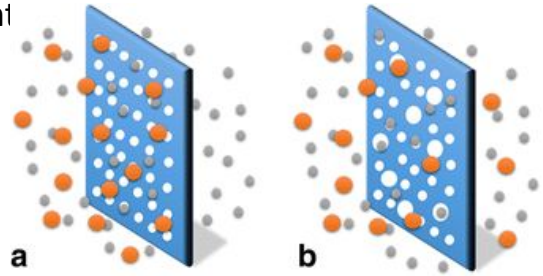
Background: Methotrexate (MTX) toxicity can be seen after high dose methotrexate infusion (HDMTX) and result in acute kidney injury (AKI), hepatitis, mucositis and myelosupression. Treatment and prevention of toxicity-related conditions could be handled with urine alkalinization, leucovorin, and glucarpidase. Sometimes extracorporeal removal techniques may be required. In the current case series, pediatric patients with acute MTX toxicity that were effectively treated with low-flux Hemodialysis (HD) were reported.

Feature / Table - 1	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Patient 6
Age	13	6	15	7	12	11
Diagnosis	Osteosarcoma	Leukemia	Osteosarcoma	Leukemia	Lymphoma	Lymphoma
Pretreatment serum creatinine value (mg/dL)	0.58	0.28	0.45	0.37	0.68	0.29
Taken Dosage	12 gr/m^2	5 gr/m^2	12 gr/m^2	5 gr/m^2	3 gr/m^2	5 gr/m^2
Serum creatinine level before the first HD session (mg/dL)	1.66 (2.86 fold inc.)	0.8 (2.85 fold inc.)	0.93 (2.06 fold inc)	1.4 (3.78 fold in.)	1.69 (2.51 fold inc)	1.71 (4 fold inc.)
Decrease rate of free MTX on the blood after the first HD *	71.9%	81.05%	81.28%	69.91%	62.45%	58.32%
Serum creatinine level after the first HD session (mg/dL)	0.74 (2.2 fold decr.)	0.15 (5.3 fold decr.)	0.32 (2.9 fold decr.)	0.88 (1.5 fold decr.)	0.8 (2.1 fold decr.)	1.07 (1.57 fold decr.)

** On the widest review published 75.7% decreasing ratio performing dialysis with high flux dialyzer membrane[1]*

Methods: The patients who required hemodialysis because of AKI and increased MTX levels after MTX infusion between 2012-2021were included in this study.

MTX levels before and after HD sessions, laboratory findings, complications and, length of hospital stay were recorded for each patient



a: low flux membrane b:high flux membrane[2]

Results: Six pediatric patients were admitted to our center because of increased serum MTX levels after the HDMTX treatment. All patients were treated with low-flux HD. After 36 hours of MTX administration with the dose of median 7 gr/m^2, plasma MTX level increased to 14-225 µmol/L (median 20.46 µmol/L) and basal creatinine increased to median 2.75 times of basal creatinine level. HD was performed on the patients at the median 55th hour of MTX infusion. Seventy percent (59.2-82%) of the methotrexate was removed with polysulphone low-flux dialyzer treatment with initial HD session. Total 19 HD sessions were applied and no HD-related complication was recorded.

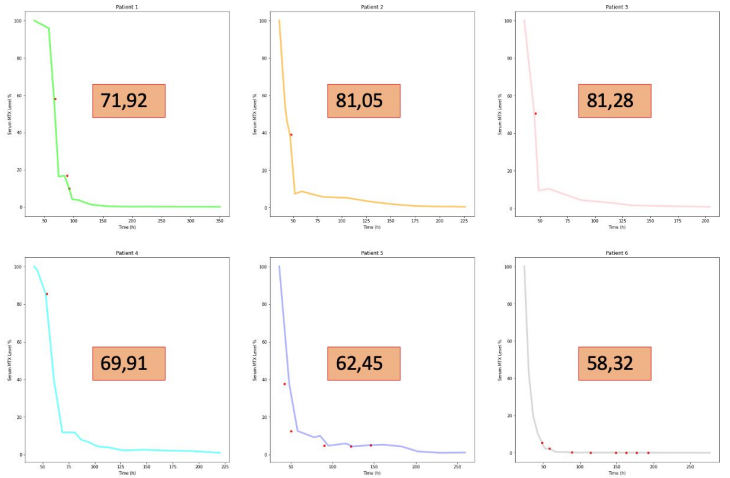


Fig: Initial HD session performed at the 55th (IQR25-75 47-51) hour of MTX treatment. As result, 70% (59.2-82%) of the methotrexate was removed with polysulphone low-flux dialyzer treatment with initial HD session. In the figure, we presented individual results.

Conclusion: In the current study, it was shown that some patients can encounter AKI and MTX toxicity after HDMTX treatment and conventional HD is effective like high flux dialyzers to improve the condition of AKI and protect will against severe toxic adverse effects via accelerating the elimination process. On the other hand, according to the last systematic review (EXTRIP Workgroup)[3], glucarpidase is the most effective agent in MTX elimination. However, we speculate that conventional HD is also an option for reachless conditions.

References: 1 2 3

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