Review

Tumor Lysis Syndrome

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The most common disease-related emergency seen by medical professionals treating children or adults with hematologic malignancies is the tumour lysis syndrome. Despite the fact that patients wth acute leukaemis & non-Hodgkin's lymphoma experience it most frequently, its prevalence is growing among individuals with tumours that are hitherto sporadic carriers of this consequence. When tumour cells spontaneously or in reaction to treatment release their contents into the circulation, it results in hyperkalemia, hyperphosphatemia, hyperuricemia, and hypocalcemia.[1] These alterations in metabolism and electrolytes can lead to clinically hazardous outcomes, such as multiorgan failure, convulsions, cardiac arrhythmias, and renal failure-related mortality. The tumour lysis syndrome may be categorised as either a laboratory or clinical condition using the current categorization scheme proposed by Cairo and Bishop.[2] A minimum of two of the metabolic abnormalities (hyperkalemia, hyperphosphatemia, hyperuricemia, and hypocalcemia) must appear within three days of the commencement of the condition or up to seven days later from the day of treatment. When seizures, an elevated creatinine level, cardiac dysrhythmia, and death occur after laboratory tumour lysis syndrome, clinical tumour lysis syndrome is said to be present. Because of cardiac dysrhythmia, it may result in abrupt death. Potassium and phosphorus level to be monitored closely during the tumour lysis syndrome risk period.[3,4]

Pathophysiology

Potassium, phosphorus, and nucleic acids are released as cancer cells lyse. These substances are subsequently metabolised to create hypoxanthine, xanthine, and uric acid as a byproduct, which is the final product.[5]

Hyperphosphatemia can crystallize as calcium phosphate in several different organs, notably in the kidneys, where it can cause acute renal injury. Hyperphosphatemia can also produce secondary hypocalcemia, which can result in neuromuscular excitability (tetany), dysrhythmia, & seizures. In addition to intrarenal crystallization, uric acid can also cause acute kidney damage.

Additionally, cytokines released by tumour lysis frequently result in multiorgan failure and systemic inflammatory response syndrome.[6] When the body's homeostatic processes cannot handle the quantities of cytokines, nucleic acids, potassium, and phosphate produced during the "cell lysis," tumour lysis syndrome develops.[7]

Within the tumour lysis syndrome, crystals cause tissue damage by causing inflammation and obstruction, as calcium phosphate, urea, and xanthine precipitate in the renal tubules. High quantities of crystallizing chemicals, low solubility, sluggish urine flow, as well as high levels of solutes; all favour crystal formation and exacerbate tumour lysis syndrome. Patients who have tumour lysis syndrome are especially at risk for crystal-associated acute renal damage.[8] Additionally, uric acid is more soluble in urine with a higher pH, whereas calcium phosphate is less soluble. Patients taking allopurinol may develop xanthine nephropathy or urolithiasis.[9]

Calcium phosphate may precipitate anywhere in the body. Those who get intravenous magnesium are at a higher risk of developing ectopic calcification. Dysrhythmias that are severe or even deadly, can develop when calcium phosphate enters the cardiac conduction system.[10]

Risk factors

Age, Cancer, White blood cell count, sort and the platform, lactate dehydrogenase level (LDH), baseline renal function, & patient comorbidities may influence the risk for developing TLS. An expert team of oncologists gathered in Paris in 2008 to talk about risk classification for TLS and to create standards for identifying individuals at low, middle, and elevated risk

for TLS.[11] For one to be identified as having LTLS, a patient needs to have at least two anomalies of high uric acid, potassium, or phosphate levels. Secondly, malignancies (both hematologic and solid tumour) were divided into three categories: Low risk disease(LRD), Intermediate risk disease(IRD) or High risk disease(HRD). The majority of solid tumours were categorised as LRD, although large tumours that are susceptible to treatment, such as small-cell and germ-cell tumours, were categorised as IRD. HRD includes AML with WBC >100x10^9, ALL with WBC >100x10^9 and high LDH, stage III/IV Burkitts Lymphoma, Lymphoblastic Lymphoma with high LDH i.e.(more than twice or normal lmit.)[12]

Prevention

The best way to treat TLS is to avoid it. ilt is crucial to appropriately identify those who are at risk and should be monitored accordingly. The key is to keeping an eye on those who are at risk for TLS , monitoring their urine production and check their serum electrolytes. In high-risk patients, hydration with IV fluids, starting prior to chemotherapy is the most crucial treatment option for TLS prophylaxis. Utilising hypouricemic medications like allopurinol and rasburicase is a crucial part of preventing TLS. By preventing the conversion of xanthine and hypoxanthine to uric acid, allopurinol stops the production of new uric acid .[13,14]

Monitoring and Management

A substantial volume of fluid is necessary to improve solute excretion and avoid the onset of following tumour lysis syndrome. This is so that potassium, phosphorus, and notably uric acid are excreted at higher rates when the glomerular filtration rate is optimal .[15]

Additionally, it is preferable to avoid nephrotoxic medications like iodinated contrast and non-steroidal anti-inflammatory medicines (NSAIDs), which have the potential to restrict renal perfusion. Xanthine oxidase inhibitors should be administered prophylactically to patients who have a moderate to high risk of experiencing tumour lysis syndrome. The general recommendation is to begin prophylactic urate oxidase blocker medication before beginning chemotherapy for patients with high-risk tumours. Rasburicase should be started for individuals whose chemotherapy might not start right away because of hyperuricemia brought on by tumour lysis syndrome.

TLS is a potentially fatal disorder that can develop spontaneously or more frequently after anticancer treatment. This severe consequence can halt or postpone anticancer treatment. The prevalence and clinical importance of this condition is rising at the time of targeted treatment. Even with competent treatment, established TLS is linked to severe morbidity and death. Therefore, prevention is the best kind of treatment. The need to recognise those who have a risk for TLS To prevent potentially fatal consequences such as seizures, renal failure, cardiac dysrhythmias, and even death from multiorgan failure, it is crucial to quickly identify and treat the metabolic abnormalities linked to TLS. Preventive allopurinol can be utilised to treat those who have a low or moderate risk of TLS, whereas those who have a high chance of developing TLS or who already have the condition, should use rasburicase. TLS, a serious oncological emergency, is characterised by the classic tetrad of hyperuricemia, hyperkalemia, hyperphosphatemia, and hypocalcemia. As the repertoire of tailored cancer medicines grows, the threat posed by TLS is increasing. In order to avoid an oncological emergency, risk assessment, and preventative medicine are essential.

Conflict of interest: Nil

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