Tumour lysis syndrome is an oncologic emergency that is characterized by severe metabolic derangements. It typically occurs in patients with lymphoproliferative malignancies such as acute lymphocytic leukemia and Burkitt lymphoma. It has also been reported in many different types of solid tumors, including lung and breast carcinoma.

Various chemotherapeutic agents have been implicated, including cisplatin, etoposide, fludarabine, intrathecal methotrexate, and paclitaxel. In addition, rituximab, ionizing radiation, interferon, and endocrine therapies such as corticosteroids and tamoxifen have been implicated. These agents increase renal risk because of their increased antitumor activity, rather than a direct toxicity of the renal tubules.

Risk factors include:
(i) large tumor burdens,
(ii) lactate dehydrogenase levels above 1500 IU,
(iii) extensive bone marrow involvement, and
(iv) high tumor sensitivity to chemotherapeutic agents.


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Hydration - Hydration should begin 2 days prior to, and continue 2 to 3 days after, chemotherapy.
- Volume expansion with isotonic saline reduces serum concentrations of uric acid, phosphate, and potassium. Excluding patients who are at risk of volume overload, aggressive fluid administration has been recommended in all patients presumed to be at risk of the syndrome. As a result of increased renal blood flow, glomerular filtration rate, and urine volume, the concentration of solutes in renal tubules is decreased, making precipitation less likely.

Hyperkalemia - The major goals of the treatment of acute hyperkalemia are cardiac membrane stabilization, intracellular shift of potassium, and reduction of total potassium load.
(i) Membrane stabilization with 10% calcium gluconate to prevent life-threatening cardiac arrhythmias. Its duration of action, however, is short lived, and treatment may need to be repeated.
(ii) Insulin promotes the intracellular shift of potassium, and is administered with dextrose to prevent hypoglycemia. Insulin plus potassium may also produce an intracellular shift of potassium.
(iii) Intravenous sodium bicarbonate can be used to reduce metabolic acidosis and also to shift potassium intracellularly. However, sodium bicarbonate should be administered judiciously in patients with acute renal failure since it can lead to inappropriate volume expansion.
(iv) Net potassium ejection can be achieved by several methods. Diuretics facilitate the renal excretion of potassium. Potassium-binding resins, such as sodium polystyrene sulfonate, exchange sodium for potassium cations in the gastrointestinal tract. Since resins typically require a longer time to effect removal, faster methods of lowering potassium such as dialysis may be required, especially in the setting of acute renal failure.

Hyperuricemia - The cornerstone of prevention and treatment of hyperuricemia includes both inhibiting the formation of uric acid as well as increasing its renal clearance.
(i) Urinary alkalinization increases the solubility of uric acid. At a physiologic pH, more than 98% of uric acid exists in the plasma as its ionized salt, urate, in an acidic urinary filtrate environment, uric acid will precipitate in the renal tubule.
(ii) The goals of urinary alkalinization should be to raise the urine pH to 7.0.
- Since calcium and phosphate can precipitate at an alkaline pH and worsen renal failure, sodium bicarbonate should be administered judiciously and discontinued when serum urate levels normalize.
(iii) In some cases, increasing urinary flow rates alone may be as effective as urinary alkalinization for decreasing the risk of uric acid nephropathy associated with tumor lysis syndrome.
(iv) Xanthine oxidase catalyzes the formation of both hypoxanthine and xanthine. Allopurinol is a structural analog of hypoxanthine and a competitive inhibitor of xanthine oxidase. The dose of oral allopurinol for tumor lysis syndrome ranges up to 800 mg/d.

Hyperphosphatemia & hyponatraemia

- Hyperphosphatemia develops from 24 to 48 hours following initiation of chemotherapy.
- Release of intracellular phosphate can exceed the renal threshold for phosphate excretion, leading to hyperphosphatemia.
- Malignant hematologic cells may contain up to four times more intracellular phosphate compared with normal mature lymphoid cells. Additionally, acute destruction of tumor cells during chemotherapy prevents the rapid reuse of phosphate for newly synthesized tumor cells.
- Precipitation of calcium phosphate occurs when the solubility product of calcium and phosphate is exceeded, possibly leading to hypocalcemia. Muscle cramps, tetany, cardiac arrhythmia, and seizures can result. Acute nephrocalcinosis, or precipitation of calcium phosphate in the renal tubules with an inflammatory response, may lead to acute renal failure. Calcium and phosphate abnormalities should be identified and treated early.

Hypocalcemia - Asymptomatic hypocalcemia should not be treated due to the risk of exacerbating calcium phosphate precipitation. Intravenous calcium gluconate is indicated for symptomatic hypocalcemia. Hypocalcemia usually resolves with treatment of the concomitant hyperphosphatemia.

renal replacement therapy:
- Dialysis is indicated when the resolution of tumor lysis-induced acute renal failure is unlikely, or whenever life-threatening electrolyte disorders or volume overload occurs.
- Dialytic support is used primarily to correct the metabolic abnormalities seen in tumor lysis syndrome and potentially limit further renal injury.
- Experience with continuous therapies in the treatment of tumor lysis syndrome is generally favorable, although it is not known if they are much more effective than intermittent therapy.
- Continuous renal replacement therapy has been utilized as a prophylactic adjunct to the treatment of patients at high risk of tumor lysis syndrome in select cases, with some encouraging results.

Renal failure (acute renal failure)
- Severe hyperkalemia (>7.0 mmol/L or change in K>2.0 mmol/L.) can adversely affect skeletal and cardiac muscle function. Electrocardiographic changes include widening of the QRS complex and peaked T waves. Hyperkalemia must be corrected rapidly before potentially fatal ventricular arrhythmias occur.

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- Urate oxidase catalyzes the oxidation of uric acid to allantoin, which is five times more soluble than uric acid. Recombinant urate oxidase, (rasburicase) is both efficacious and well tolerated.

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