

Tumour-Induced Osteomalacia (TIO), also known as oncogenic osteomalacia, is an acquired disorder caused typically by small, slow-growing, benign phosphaturic mesenchymal tumours (PMTs).^{1,2} TIO is characterised by chronic hypophosphataemia caused by tumour(s) secreting excess fibroblast growth factor 23 (FGF23), which can lead to issues such as decreased intestinal phosphate absorption and compromised vitamin D activation.^{1,2}



It is a rare condition with fewer than
1000 cases reported in
the medical literature²



TIO although it does occur in children, mainly
affects adults and has a mean onset
age of **40-45 years**^{1,3}

What is the impact of TIO?

TIO is associated with progressive and debilitating musculoskeletal deficits,^{4,5} ultimately having a detrimental impact on ability to perform daily activities, as well as on physical and social wellbeing.⁶

The most common signs and symptoms include⁴



bone pain



difficulty
walking



pathological
fractures



height
loss



muscle
weakness

In TIO, muscle weakness and pain can interfere with physical functioning, including standing up without assistance, walking and ability to work.⁶ The pain in TIO can also interfere with mood and enjoyment of life for those living with it.⁶

How is TIO diagnosed?

The diagnosis of TIO, because of the disease's rarity, is often missed and/or delayed, and so testing serum phosphate levels (for serum hypophosphataemia) is important to aid diagnosis.¹ Due to the rarity of TIO, it has been documented that in some patient cases, it had taken 28 years from symptom onset to reach an official diagnosis of TIO, a consequence from lack of routine phosphate testing and disease awareness, non-specific symptoms and elusive tumour.^{1,5}

In people with unexplained, ongoing musculoskeletal deficits, the first step in TIO diagnosis is to establish the presence of hypophosphataemia and renal phosphate wasting by assessing serum phosphate levels and ratio of tubular maximum reabsorption of phosphate to glomerular filtration rate (TmP/GFR), respectively.¹

Definitive diagnosis of TIO is established by identifying the causative tumour(s) and resolution of biochemical symptoms following complete surgical removal, where possible.¹

How is TIO treated?

The only cure in TIO is complete surgical resection of the causative tumour(s).¹

However, surgical resection is not always possible due to the anatomical location and difficulty in detecting tumours.^{1,3} TIO may recur and persist following incomplete or unsuccessful surgical resection.⁷

Pharmacological treatment should be considered in TIO cases where tumour(s) cannot be curatively resected or localised.¹

References

1. Brandi ML, et al. Challenges in the management of tumor-induced osteomalacia (TIO). *Bone*. 2021;152:1160-64.
2. Florenzano P, et al. Tumor-Induced Osteomalacia. *Calcified Tissue International*. 2021;108:128-42.
3. Dahir K, et al. Diagnosis and Management of Tumor-Induced Osteomalacia: Perspectives from Clinical Experience. *Journal of the Endocrine Society*. 2021;5:1-12.
4. Feng J, et al. The diagnostic dilemma of tumor induced osteomalacia: a retrospective analysis of 144 cases. *Endocrine Journal*. 2017;64:675-83.
5. Minisola S, et al. Tumour-induced osteomalacia. *Nature Reviews Disease Primers*. 2017 ;3 :17044.
6. Jerkovich F, et al. Burden of Disease in Patients with Tumor-Induced Osteomalacia. *JBMR Plus*. 2020;5:e10436.
7. Cianferotti L, et al. Persistence and recurrence in tumor-induced osteomalacia: A systematic review of the literature and results from a national survey/case series. *Endocrine*. 2022;76:709-721.