

## Thyroxine Replacement in Patients on Parenteral Nutrition: A Clinical Conundrum

Sir,

Thyroxine is a hormone known to have unique pharmacokinetics and its intestinal absorption is affected by a number of factors. Variation in the absorption of thyroxine can occur due to its interaction with food (if not taken on empty stomach), decreased intestinal transit time in case of diarrhoea and different preparations and brands of thyroxine used.<sup>1</sup> Patients with markedly reduced intestinal absorptive area, such as those with intestinal failure or short gut syndrome, may not be able to absorb even a small amount of thyroxine taken orally. We recently encountered a patient who was started on parenteral nutrition and required life-long thyroxine replacement.

A 45 years woman was brought to our hospital with complaints of severe abdominal pain for the past few hours. She was a known case of hypothyroidism and protein-C deficiency and was taking thyroxine and warfarin for these conditions respectively. On initial evaluation, the abdominal pain was out of proportion to the findings noted on examination. Laboratory investigations revealed a sub-therapeutic International Normalized Ratio (INR). A computed tomography scan of the abdomen was consistent with superior mesenteric vein thrombosis. Anti-coagulation with heparin was started and decision was made to proceed with laparotomy. Intra-operatively, she was noted to have ischemic small intestinal loops and extensive small bowel resection was performed. After recovering from surgery, she was started on parenteral nutrition. One month after the surgical procedure, the patient complained of fatigue and cold intolerance. A Thyroid Stimulating Hormone (TSH) level was obtained, which was markedly above the normal range (55 mIU/L). Thyroxine replacement was thus deemed necessary for this patient. However, the route and method of administration of thyroxine posed a clinical conundrum.

The patient was initially administered intravenous injections of thyroxine.<sup>2</sup> However, no definitive approach

could be adopted for long-term thyroxine replacement in her case. The commercially available preparations of thyroxine are not suitable for subcutaneous injection. While there are occasional reports of administration of thyroxine rectally,<sup>3</sup> there are no large scale studies to establish their efficacy and reliability. Even for intravenous injections, the frequency and dosage for long-term replacement have not been standardized.<sup>4,5</sup> Furthermore, the intravenous formulation of thyroxine is not widely available in many countries of the world including Pakistan. The cost involved in obtaining and administering thyroxine intravenously for life in such patients, especially in developing countries, is prohibitive and further compounds this problem. There is a dire need to conduct large scale clinical studies to devise low cost, feasible and effective approaches for the long-term, intravenous replacement of thyroxine in patients on total parenteral nutrition. Furthermore, novel inventions of subcutaneous or sublingual thyroxine therapy are urgently needed for such clinical problems.

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Abdul Rehman<sup>1</sup>, Noor Ul-Ain Baloch<sup>1</sup> and Muhammad Awais<sup>2</sup>

Department of Biological and Biomedical Sciences<sup>1</sup> /  
Radiology<sup>2</sup>, The Aga Khan University Hospital, Karachi.

Correspondence: Dr. Abdul Rehman, Flat E-6, Five Star  
Apartments, St-6/D, Block 14, Gulshan-e-Iqbal, Opposite  
D.C. Office, Karachi.

E-mail: jsmawais@yahoo.com

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