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Hypothyroidism is a rare cause of isolated constipation: 5-year review of all thyroid tests in a pediatric gastroenterology office

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Abstract

The prevalence of constipation in children is high and accounts for a large percentage of pediatric and pediatric gastroenterology visits. Thyroid testing is frequently ordered to evaluate constipation and other gastrointestinal complaints in children. We reviewed all patients with thyroid testing ordered by our pediatric gastroenterology division over a five-year period. We found 873 patients on whom thyroid testing was performed, and 56 had evidence of hypothyroidism. Nine patients had constipation and clinically significant hypothyroidism in this group. However, only one child had constipation as their sole presenting symptom. The contribution of occult hypothyroidism to isolated constipation in children may have been previously overestimated.

Keywords

constipation; hypothyroidism; failure to thrive

Background

The prevalence of constipation in the pediatric population is high, approaching 30%(1). Approximately 5% of general pediatric outpatient visits and up to 25% of pediatric gastroenterology outpatient visits are for constipation(2). Textbooks and clinical practice guidelines from the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition (NASPGHAN) suggest that hypothyroidism should be considered in the differential diagnosis of constipation(2,3). For this reason, thyroid studies are frequently obtained as part of standard evaluation for children with constipation, as well as for other problems in pediatric gastroenterology offices. Data to justify routine screening for hypothyroidism in constipated but otherwise healthy children, adolescents, and young adults are lacking.

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Studies comparing bowel movement frequency or other bowel symptoms in euthyroid, hypothyroid, and hyperthyroid adult patients have yielded mixed results(4, 5). Physiologic studies show altered anorectal function in adult patients with both hypo- and hyperthyroidism, but equivocal findings in bowel transit times or symptoms of constipation(6, 7). To our knowledge, there are no studies of the prevalence of hypothyroidism in pediatric patients referred for evaluation of constipation. In this study, we performed a retrospective chart review to determine the prevalence of unrecognized hypothyroidism among pediatric patients referred to our gastroenterology office who had thyroid testing performed.

Methods

We reviewed records for all patients with free thyroxine (free T4) or thyroid-stimulating hormone (TSH) tests ordered by the pediatric gastroenterology division at St. Louis Children's Hospital between January 1, 2003 and January 1, 2008. Hypothyroidism was defined by the following laboratory values: free T4 < 0.8 ng/μL (for all ages), TSH > 10 mIU/L (4 days – 30 days of age), or TSH > 5.5 mIU/L (older than 30 days of age). A full chart review was performed for all patients with thyroid testing, which included review of clinical presentation (i.e., indications for ordering thyroid tests, as enumerated in the pediatric gastroenterology consultation note), past medical history, medication history, other laboratory tests, radiologic evaluation, and consultation with other subspecialty services. All medical contact within a large, metropolitan hospital system using a single electronic medical record was ascertained, although no patient contact was initiated. The United States Department of Health and Human Services (HHS) Center for Medicare and Medicaid Services 2011 Clinical Laboratory Fee Schedule(8) quotes a median (mean) cost of \$12.69 (\$12.47) for a free T4 and \$23.64 (\$23.58) for a TSH. There is considerable variation in the cost in practice. For instance, the amount billed at our large referral children's hospital in 2011 was approximately \$205 for TSH and \$176 for free T4, whereas the amount collected ranged widely, from \$41–102 for TSH and \$35–88 for free T4. Similarly, an endocrinology consultation is listed by HHS as \$47.18, although patients may be billed as much as \$455, depending upon insurance coverage. In order to determine the total number of patients seen for constipation and slow growth over this time period, we counted all diagnostic codes consistent with these diagnoses. Individual chart reviews were only performed for patients who had thyroid testing.

The Human Research Protection Office and the Institutional Review Board at Washington University School of Medicine reviewed and approved this study.

Results

Patients

Free T4, TSH, or a combination of these tests was ordered 1,280 times over a 5 year period on a total of 873 unique patients. The mean age was 7.4 years, with a range from 10 days to 20.5 years, and 454 (52.0%) were male. 443 children (50.7%) had constipation alone, 93 (10.7%) had slow growth alone, 85 (9.7%) had vomiting, 80 (9.2%) had cholestasis or hypertransaminasemia, 40 (4.6%) had both constipation and slow growth, 57 (6.5%) had

another indication for the test, and 75 (8.6%) did not have an indication for the test clearly indicated in the consultation note. Of the 2911 unique patients with constipation (6197 total encounters), 483 (16.6%) had thyroid testing performed. Of the 420 children seen for slow growth (1215 encounters), 133 (31.7%) had thyroid testing performed. Because this is a retrospective analysis, the decision to test for hypothyroidism was at the discretion of the attending physician. We were unable to identify any change in practice patterns during the years evaluated.

817 of these children (93.6%) had normal thyroid tests. 56 children (6.4%) had elevated TSH, decreased free T4, or a combination of the two. Of the 56 abnormal tests, 40 were normal when repeated. 11 of these 40 had documentation indicating that TSH levels were drawn during an acute illness, and elevated levels were thought to be a transient phenomenon. For the other 29 out of 40 whose thyroid tests normalized, no documentation for the likely cause for the transiently abnormal TSH was given. Of the remaining 16 children with abnormal testing that either did not normalize, or who were not retested, seven had known hypothyroidism prior to testing in our gastroenterology office. Nine of the 56 abnormal thyroid tests (1.0% of all children evaluated) led to a new diagnosis of hypothyroidism. These results are summarized in Figure 1.

Of the nine children with newly diagnosed hypothyroidism, only seven had constipation. Two of the nine children were being evaluated for slow growth without constipation. Three children referred for constipation had trisomy 21, so thyroid function testing should have been part of their routine health evaluation as recommended by the American Academy of Pediatrics(9). Two children with constipation and newly diagnosed hypothyroidism were taking medications (interferon- γ for active hepatitis C and carbamazepine for epilepsy) known to cause secondary hypothyroidism(10, 11). In each case, hypothyroidism resolved after cessation of the medication. One patient with hypothyroidism was being evaluated for both slow growth and constipation. Thus, only one patient with newly diagnosed hypothyroidism presented to our office with constipation as their only recognized symptom of disease, as reported by parents and recorded in our office consultation.

Of those patients with normal screening results, it is unknown how many went on to develop hypothyroidism later in life. At the time of the review in 2009–2010, none of the patients with a normal TSH went on to have a repeat measurement performed by another service at our institution that was abnormal. It is unknown if any of these children had thyroid testing performed at other institutions within this time period.

Costs

The costs for laboratory testing were at least \$27,400 for the 1280 blood draws ordered in our gastroenterology office, although they may be as high as \$213,120. 18 patients were referred for endocrinology consultations, adding at least an additional \$849 in consultation fees, but this may be as high as \$8,190, depending upon insurance coverage. Eight of the referred children had hypothyroidism as a final diagnosis. Total costs billed for thyroid evaluation of children in our study were above and beyond the cost of the initial pediatric gastroenterology consultation, which was not included in this analysis. The cost of screening the normal patients was \$18,653, but may be as high as \$147,159, again depending on

insurance coverage. Intangible costs include repeated painful procedures (venipuncture) performed on 56 children, indirect costs to the family, such as transportation, childcare, and missed work for additional appointments, and were not included in the above calculations.

Discussion

A medical position statement from the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGHAN) recommends thyroid hormone evaluation in children only in cases of severe, refractory constipation, and in most cases prior to consultation with a pediatric gastroenterologist(2). At our institution, the majority of patients referred to our pediatric gastroenterology clinic for constipation have already tried unsuccessfully to manage the condition in conjunction with their pediatrician before referral. These children often have had symptoms for months or years prior to referral and might therefore be considered refractory (although, admittedly, the degree and duration of constipation in all children referred to our clinic was not assessed in this study). Even among this selected patient population, our data suggest that thyroid function tests are unlikely to be abnormal in the absence of other clinical indications or risk factors for hypothyroidism, such as concomitant growth failure, medications, or genetic predisposition (as in trisomy 21).

This retrospective review is limited by the fact that only a small percentage of children with constipation who were seen in our office were tested for hypothyroidism (16.6%) and it is not clear if there is a difference between the tested and untested populations. For this analysis, we decided to assess all patients with thyroid testing, rather than patients with a specific diagnosis (such as constipation), to better understand the utility and practice patterns for thyroid hormone testing in a pediatric gastroenterology referral practice. We also did not make a prospective effort to identify children with recognized hypothyroidism or a family history of hypothyroidism, although it is anticipated that this would have been discussed as a routine part of our clinical care. Furthermore, it is possible that children who presented with constipation were identified as having hypothyroidism in their pediatrician's office and were referred to endocrinology instead of to our gastroenterology office. This is likely to be uncommon, however, since very few of the children referred to our office for constipation have any thyroid testing prior to the office visit, although this was not assessed systematically in all patients. Despite these concerns, the very low incidence of hypothyroidism in our referral population suggests that testing for hypothyroidism in children who have constipation as their only symptom is unlikely to be helpful.

Large-scale epidemiologic studies estimate that while 4.6% of the U.S. population has elevated TSH, only 0.3% of the population (including children) has clinically significant hypothyroidism(12). Assuming that our results are representative, the likelihood of identifying a new case of hypothyroidism among constipated children without other clinical indicators (in our population, approximately 0.2%, or 1/443) is no greater than the likelihood of finding children with hypothyroidism by random population screening (0.3%). The yield of thyroid testing improves when the denominator is changed: in patients with both constipation and slow growth, 2.5% (1/40) were hypothyroid; in patients with slow growth alone, 2.2% (2/93) were hypothyroid. Thus, our data suggest that while slow growth increased the likelihood that a child has hypothyroidism, the presence of constipation did not

affect the likelihood that a child had hypothyroidism ($P = 0.6$, z -test, SigmaPlot 11). Furthermore, the financial cost of finding a single case of unrecognized hypothyroidism is high. Therefore, we question the wisdom of routine thyroid function testing in children with constipation unless there are other compelling clinical data to suggest the diagnosis.

In conclusion, we have reviewed all thyroid tests ordered by our pediatric gastroenterology office over a 5 year period, and found that only a small proportion of those we tested whose symptom was isolated constipation had hypothyroidism (0.2%), while those evaluated for constipation with slow growth or slow growth alone were much more likely to be hypothyroid (2.5% and 2.2%, respectively). Identifying a single case of hypothyroidism over this time period in a child who presented with constipation alone cost at least \$18,653. While it might be argued that this is a reasonable price to pay, constipation alone did not increase the likelihood of hypothyroidism above the population prevalence for this disease.

Although there are some limitations to our analysis, our data suggest that careful consideration should be given when ordering free T4 and TSH concentrations in children with constipation without other clinical indicators of hypothyroidism. This question needs further investigation before these results can be applied, ideally with prospective observation of a large pediatric cohort.

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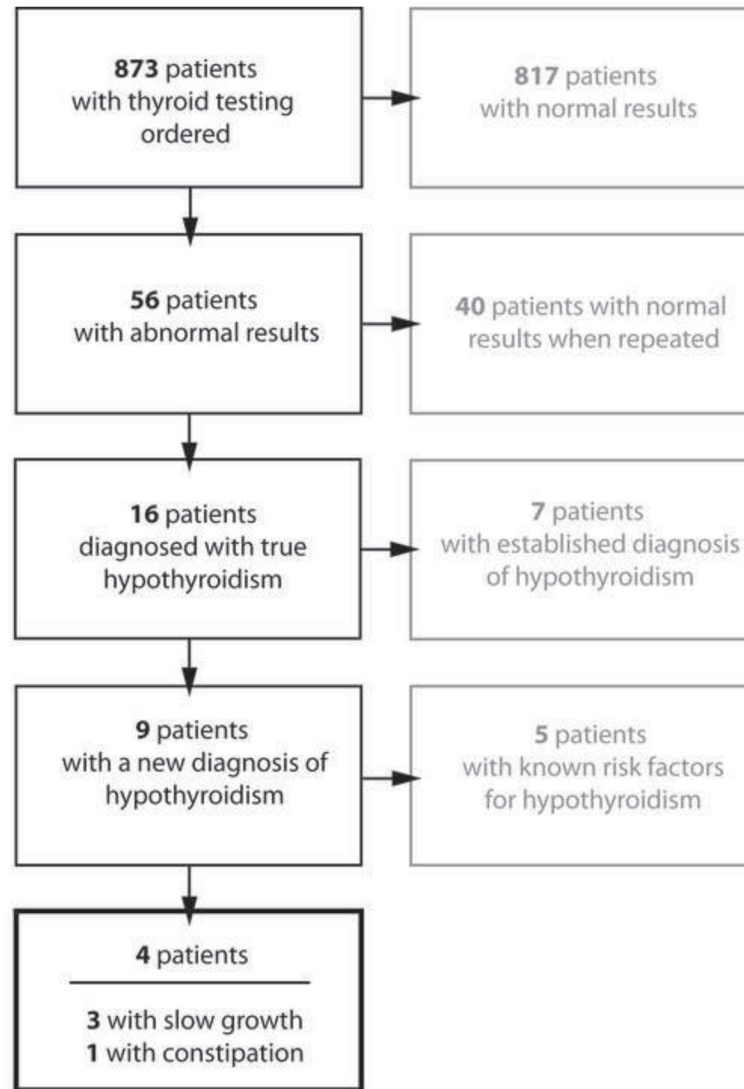
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**Figure 1.**