Chewing Gum Bezoars of the Gastrointestinal Tract

ABSTRACT. Children have chewed gum since the Stone Age. Black lumps of prehistoric tar with human tooth impressions have been found in Northern Europe dating from ~7000 BC (Middle Stone Age) to 2000 BC (Bronze Age).[1] The bite impressions suggest that most chewers were between 6 and 15 years of age. The Greeks chewed resin from the mastic tree (mastic gum). North American Indians chewed spruce gum. The first manufacturing patent for chewing gum was issued in 1869 for a natural gum, chicle, derived from the Sopadilla tree, indigenous to Central America. Chewing gum sold today is a mixture of natural and synthetic gums and resins, with added color and flavor sweetened with corn syrup and sugar. Chewing gum is big business. A significant amount of the $21 billion US candy industry sales is from chewing gums, many of which appeal almost exclusively to children. Despite the history and prevalence of gum chewing, the medical literature contains very little information about the adverse effects of chewing gum. In the present report, we briefly review gum-chewing complications and describe three children who developed intestinal tract and esophageal obstruction as a consequence of swallowing gum. *Pediatrics* 1998;102(2). URL: http://www.pediatrics.org/cgi/content/full/102/2/e22; *gum, chewing gum, constipation; fecal mass.*

CASE REPORTS

Case 1

A boy, 4½ years of age, was referred with a 2-year history of constipation. His constipation was associated with encopresis and began shortly after toilet-training. Episodes consistent with fecal withholding were part of the interval history and included facial grimace, leg-stiffening, and buttock-clenching ("duty dance"). The early history was normal and included passage of meconium within the first 24 hours of life. The diet history was not unusual; he drank a total of ~16 oz of cow milk daily. The family history included the patient's father with encopresis until 8 years of age, which resolved without treatment. A variety of laxative treatments and positive reinforcement was attempted. Candy, especially chewing gum, was given as a reward for successful toileting. Constipation was reported well before any candy or gum reward. The parent described the child's stools as dry and "like glue." The physical examination was normal except for soiled undergarment and a palpable firm mass in the left lower quadrant. The cremasteric and anal wink reflexes were present. Anorectal examination demonstrated normal sphincter tone without expulsion of gas or feces. A firm fecal mass was palpated at <3 cm from the anal verge. An unprepared barium enema study revealed a large amount of stool confined mostly to the rectum without a transition zone. The initial treatment plan was behavior modification with regular, daily intervals on the commode; mineral oil (30 mL bid); fiber supplements; and saline enemas (5 oz each night for 4 nights). This clean-out regimen produced no results after 4 days. On the 5th day, the child was brought in for manual disimpaction under conscious sedation and rectal suction biopsy. On removal of the leading edge of the fecoma, a "taffy-like" trail of fecal material remained in the rectum. This mass was eventually manually withdrawn and was primarily made up of chewing gum. On further history, this boy always swallowed his gum after chewing five to seven pieces of gum each day. The rectal biopsy demonstrated normal ganglion cells.

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Case 2

A 4¼-year-old girl was referred because of encopresis, constipation, and barium enema findings that showed megarectum. The early life, medical, and family histories were noncontributory. The physical examination revealed a palpable firm mass in the left lower quadrant, soiled undergarment, and firm stool in the rectal vault. Phosphosoda enema, fiber supplements, mineral oil, and behavior modification were ineffective. Manual disimpaction occurred 7 days later with conscious sedation. On this occasion, the fecal mass was unmistakably chewing gum, because it contained multiple spheres of chewed gum congealed into a multicolored rectal mass. Dislodging the mass revealed the taffy-pull sign. Ganglion cells were evident on rectal suction biopsy. After the disimpaction, the family reported that chewing gum was part of a positive reinforcement system used on many occasions each day. The child had the habit of swallowing gum, often just to get another piece.

Case 3

A 1½-year-old was brought to the emergency department with drooling, cough, and dysphagia of sudden onset. Chest x-ray examination revealed a radiopaque object, which appeared to be stacked coins, just below the cricopharyngeus. Upper endoscopy confirmed that the child had four coins in the proximal esophagus that were wrapped with a peculiar sticky wax-like substance (Fig 1). When pulled on, the wax substance showed the taffy-pull sign on grasping by the coin retrieval instrument. The mass was advanced to the stomach; one coin was separated with difficulty and then easily removed with a coin retriever. The remaining three adhered coins (2 dimes, 1 penny) then were grasped in toto and withdrawn easily from the stomach. The parents reported that their child was chewing gum just before the onset of symptoms and was a regular user of gum despite her young age.

DISCUSSION

Chewing gum has been associated with many adverse health effects. In most cases, additives (sweeteners, flavorings, preservatives) and not gum induce pathology (Table 1). For example, sorbitol (in "sugarless" gum and candy) nonabsorption may cause diarrhea, abdominal pain, and flatulence.[2] Cinnamon flavoring has been linked to mouth ulcers.[3] Bubble gum may induce a perioral dermatitis with granulomatous histology; the postulated mechanism of this perifollicular lesion is selective absorption of certain gum oils by the follicle.[4] Chlorophylla, menthol, and butyl hydroxytoluene additives can induce a disseminated cutaneous urticaria.[5] Licorice flavoring in chewing gum (glycyrrhiza) can induce hypokalemia and hypertension.[6,7] Frequent oral cavity exposure to concentrated sugars facilitates dental caries.

Gum chewing also may induce mechanical injury to teeth (Table 2), extrusion of dental repairs (fillings, crowns, bridges, orthodontics), and overuse injury including temporomandibular joint syndrome. A syndrome of temporalis and other masticatory muscle hypertrophy has been reported with so-called "chewing gum abuse."[8] Mercury levels are higher in

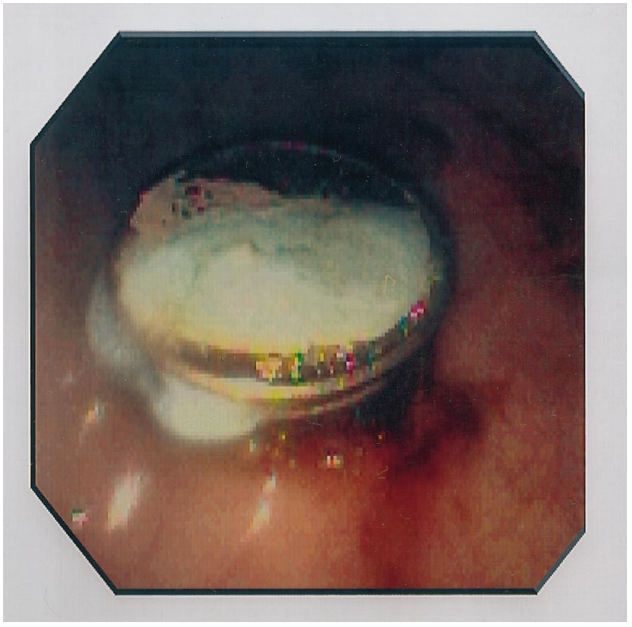

Fig 1. Four coins stuck in gum lodged in esophagus.

TABLE 1. Complications From Additives to Chewing Gum

Symptoms	Cause
Diarrhea, flatulence, borborygmi	Sorbitol
Mouth ulcers	Cinnamon flavoring
Perioral dermatitis	Gum oils
Diffuse cutaneous urticaria	Chlorophylla, menthol, butylhydroxytoluene
Dental caries	Concentrated sweetener, corn syrup
Hypertension, hypokalemia	Licorice (glycyrrhetinic acid)

TABLE 2. Adverse Mechanical Effects of Chewing Gum

Extrusion of dental work
Temporomandibular joint syndrome
Hypertrophy of masticatory muscle
Increased serum mercury level
Increased air swallowing
Occlusion of endotracheal tube
Esophageal or colonic bezoar

excessive gum chewers because of the release of mercury from dental amalgam.[9]

In addition, the cost to maintain public and private facilities free of discarded chewing gum is enormous. Gum pollution ("gumfitti") has created an entire industry of solvents and gum-removal devices. The environmental effects of using solvents to remove accidental or purposeful gum pollution has not been studied.

Our report of two children with protracted constipation and chewing gum rectal bezoar is another example of gum pollution requiring expensive clean up. Other authors have previously reported gum removal to relieve symptoms. A patient was found to have a chewing gum obstruction of her endotracheal tube while undergoing elective surgery; she admitted her noncompliance to the NPO preoperative orders.[10] Three separate case reports of bubble gum intestinal bezoar in children have been noted elsewhere.[11–13] Swallowed bubble gum in the gastrointestinal tract simulated calcification on plain abdominal x-ray examination.[14]

Our report adds to an already long list of adverse health effects from chewing gum. Two patients, each toddlers, received gum on a daily basis and their means of discarding the gum (swallowing) was well known to the families and was a source of levity. Each child presented with intractable, medically refractory constipation that required manual stool removal. Interestingly, the disimpaction procedure is characteristically a "taffy-pull." The rainbow of fused, multicolored gum fragments in the removed fecoma is easily recognized by physician and family as old gum. It is assumed that the third patient, an infant, put multiple coins in her mouth at a time when she was chewing gum. The coin–gum mass produced esophageal obstruction when swallowed (Figure). The "taffy-pull" sign again was evident, and it was difficult to strip the gum away from the coins. The finding of an imperfectly round coin on x-ray examination has been reported to indicate the presence of multiple adhered coins.

In summary, chewing gum should not be swallowed and not given to children who cannot understand this point. Chewing gum does have occasional beneficial use as a delivery system for drugs (nicotine, aspirin, bismuth). However, chewing gum has documented deleterious effects in the oral cavity and may obstruct the esophagus and colon. With regard to the older infant and toddler, anticipatory guidance about gum should be outlined for the parent. For example, the toddler with constipation should also have practice of gum-chewing noted in the medical history. Gum-swallowing in a child with chronic constipation or acute coughing and drooling should raise suspicion about chewing gum intestinal or esophageal bezoar. This is especially important when the taffy-pull sign accompanies the manual disimpaction or even is noted on routine rectal examination.

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