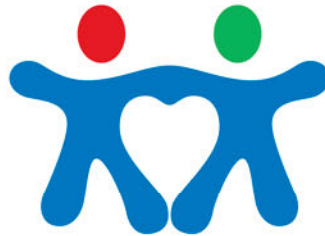




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GI Issues in Early Onset Spinal Deformities

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GI Issues in Early Onset Spinal Deformities

- Surgical stabilization is valuable in stopping progression of scoliosis
- Proper patient selection and careful preoperative preparation is important



GI Issues in Early Onset Spinal Deformities

- GI and nutritional co-morbidities are often seen in disorders associated with early onset scoliosis
 - Cerebral palsy
 - Neuromuscular disease
 - Chromosomal abnormalities
 - Congenital anomalies
 - Vertebral anomalies



GI Issues in Early Onset Spinal Deformities

- GI and nutritional co-morbidities
 - Feeding problems
 - Undernutrition, Growth failure
 - GER
 - Motility problems/Constipation
 - Micronutrient deficiencies
 - Osteopenia



GI Issues in Early Onset Spinal Deformities

- CP and Scoliosis
 - Scoliosis occurs in ~25% of patients with CP
 - Most common in spastic quadriplegia
 - Incidence is 60-75%
 - More likely to progress in adult patients with cerebral palsy compared to idiopathic scoliosis
 - Feeding problems occur frequently
 - 90% of preschool children with CP had oral motor dysfunction during the first year of life
 - *Severe feeding difficulties preceded the diagnosis of cerebral palsy in as much as 60% of patients*



GI Issues in Early Onset Spinal Deformities

- Patients with neurologic disease
 - Oral motor dysfunction is a major factor in the pathogenesis of undernutrition and usually correlates with the severity of motor impairment
 - Undernutrition affects linear growth
 - Height and weight Z-score deficits generally correlate well in neurologically impaired children, suggesting that nutritional factors contribute to their growth
 - Nutritional status explains 10%-15% of the variability in linear growth in children with cerebral palsy

GI Issues in Early Onset Spinal Deformities

- Poor nutrition can result in:
 - Vitamin, trace element, and essential fatty acid deficiencies typical with reduced dietary intake
 - Iron, selenium, zinc, vitamins C, D, and E, and essential fatty acid deficiencies reported to be present in 15%- 50%
- Osteopenia is prevalent in neurologically impaired
 - Contributing factors:
 - Limited ambulation
 - Anticonvulsant therapy
 - Reduced sun exposure
 - Nutrition



GI Issues in Early Onset Spinal Deformities

- **Why is nutrition important?**
 - Poor nutrition is a major risk factor for postoperative complications
 - Infection
 - Longer postoperative intubation
 - Longer hospitalization
 - SMA syndrome
 - Decubiti
 - Markers have included
 - Hematocrit less than 33
 - Albumin less than 3.5 g/L
 - Blood lymphocyte count less than 1500



GI Issues in Early Onset Spinal Deformities

- Gastroesophageal reflux
 - Many disorders associated with early-onset spinal deformities have an increased risk of gastroesophageal reflux disease
 - GER
 - May increase risk of postoperative aspiration
 - Has been found to be a risk factor for postoperative pancreatitis
 - May complicate postoperative feeding



GI Issues in Early Onset Spinal Deformities

- Motility Issues
 - Postoperative Ileus
 - Effects 3-10% of patients
 - Typically resolves within 3-4 days with conservative management
 - Acute colonic pseudo-obstruction
 - Reported in 5-10% of adult patients
 - Constipation
 - Common preoperatively
 - Postoperative constipation is common
 - Narcotic pain management makes constipation worse

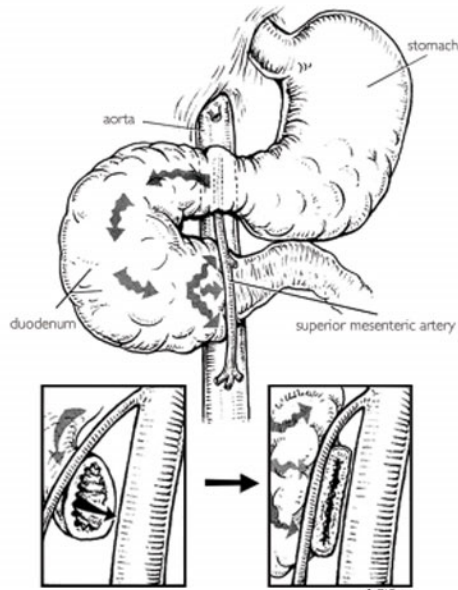


GI Issues in Early Onset Spinal Deformities

- Superior mesenteric artery syndrome
 - Typically presents within one week of surgery
 - May present up to 2 weeks later
 - Nausea and bilious vomiting
 - Risk is greatest in patients with weight for height less than the 3rd percentile

GI Issues in Early Onset Spinal Deformities

- Superior mesenteric artery syndrome
 - Obstruction of the third portion of the duodenum by compression between the abdominal aorta and superior mesenteric artery





GI Issues in Early Onset Spinal Deformities

- Postoperative pancreatitis
 - May occur in 10-30% of patients
 - Has been associated with
 - Increased intra-operative blood administration
 - Gastroesophageal reflux
 - Asthma



GI Issues in Early Onset Spinal Deformities

- Preoperative evaluation and management
 - Goal is to
 - Identify preoperative morbidities
 - Decrease risk factors for postoperative complications
 - Maximize healing
 - Minimize hospitalization

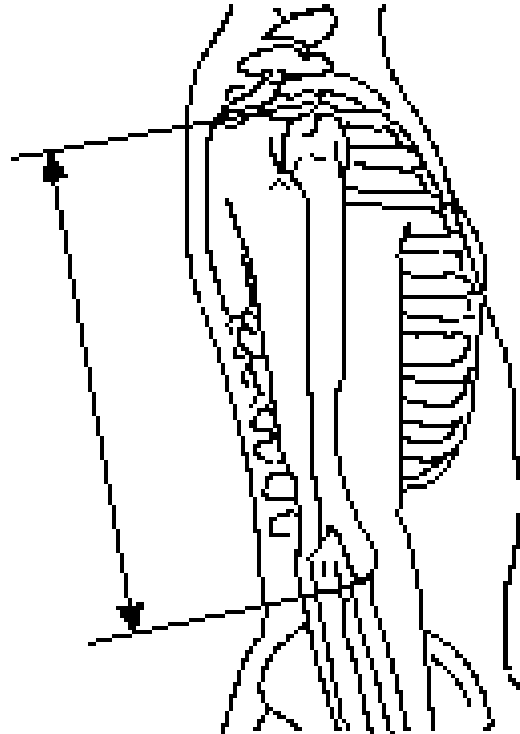


GI Issues in Early Onset Spinal Deformities

- Nutritional assessment
 - Need to evaluate weight for height or BMI
 - Alternative measurements of height can be used in patients with severe scoliosis and/or contractures
 - Upper arm length measurement
 - Lower leg length measurement
 - References exist to extrapolate for height

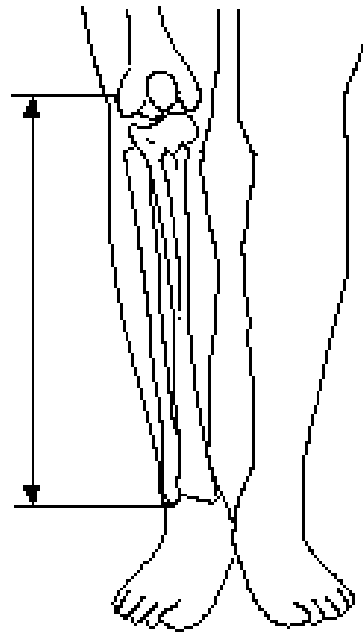
Upper Arm Length Measurement

Measure the slant distance from the shoulder joint to the elbow



Lower Leg Length Measurement

Measure the slant distance from lateral epicondyle of the femur to the peak of the lateral malleolus



GI Issues in Early Onset Spinal Deformities

- Nutritional assessment
 - Some centers will use triceps skinfold thickness
 - Identifies 96% of children with depleted fat stores, whereas weight-for-height less than the 10th percentile identifies only 55%



Triceps Skinfold Thickness



Landmark

At the level of the mid-point between the lateral edge of the acromion and the proximal/lateral border of the radius, approximately the elbow joint), on the mid-line of the posterior (back) surface of the arm (over the triceps muscle).

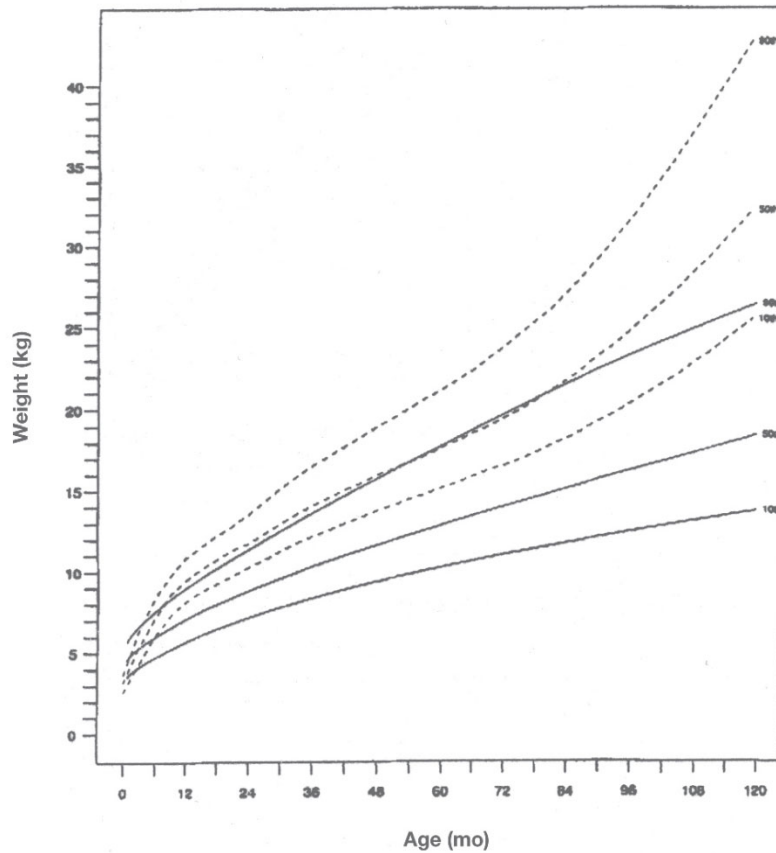


Pinch

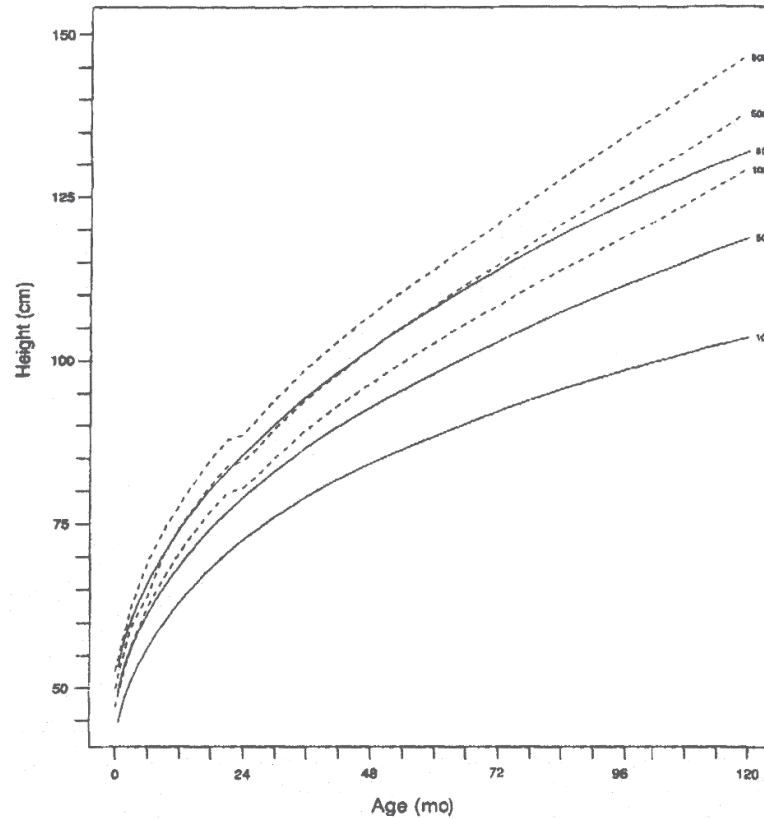
The arm should be relaxed with the palm of the hand facing forwards (supinated).

A vertical pinch, parallel to the long axis of the arm, is made at the landmark

CP Growth Charts

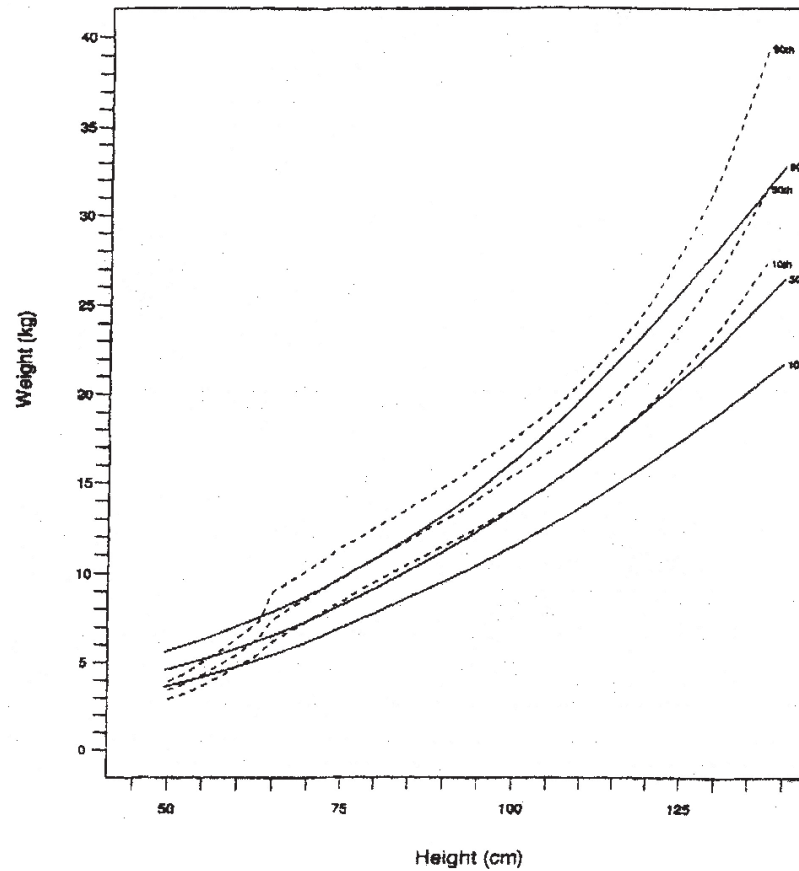


Weight-for-age percentile curves for girls with CP



Length-for-age percentile curves for girls with CP

CP Growth Charts



Weight-for-length percentile curves for girls with CP

GI Issues in Early Onset Spinal Deformities

- Preoperative evaluation and management
 - Nutritional assessment
 - If less than 25th percentile consider nutritional supplementation prior to surgery
 - » Oral supplementation can be used in patients without feeding difficulties
 - » Nasogastric tube supplementation for those with inadequate oral intake
 - » Consider need for permanent gastrostomy
 - » It can take several months to improve nutritional status



GI Issues in Early Onset Spinal Deformities

- Preoperative evaluation and management
 - Extensive laboratory evaluation generally is not necessary
 - Basic labs
 - CBC and serum ferritin
 - Serum albumin and pre-albumin
 - Metabolic profile
 - Vitamin D (OH)₂₅

GI Issues in Early Onset Spinal Deformities

- Preoperative evaluation and management
 - Treatment of constipation if indicated
 - Osmotic laxatives are preferred
 - » MiraLAX 1-2 g per kilogram per day
 - » Lactulose 1-2cc/kg/dose 1-2 times per day
 - » Milk of magnesia 1-2cc/kg/dose 1-2 times per day
 - Management of GER
 - Acid suppression (PPI vs H2RA)
 - Prokinetics
 - » Cisapride not available in the U.S



GI Issues in Early Onset Spinal Deformities

- Postoperative Issues
 - Nutrition
 - Need to maintain nutrition
 - Avoid catabolic state
 - Methods
 - Parenteral nutrition
 - Nasogastric tube or gastrostomy tube feedings
 - Transpyloric feedings



GI Issues in Early Onset Spinal Deformities

- Postoperative Issues
 - Ileus
 - Conservative management
 - Reglan and erythromycin have not been shown to be effective
 - Cisapride may be of some benefit
 - Not available in the United States



GI Issues in Early Onset Spinal Deformities

- Postoperative Issues
 - Constipation
 - Should be managed early on
 - Osmotic laxatives
 - May result in wound soiling
 - Need to balance stool consistency with wound location
 - » Consider suppositories
 - » Stimulant laxatives may be of use



GI Issues in Early Onset Spinal Deformities

- Postoperative Issues
 - SMA Syndrome
 - NGT decompression
 - Transpyloric feeds
 - TPN if unable to feed
 - Goal is weight gain
 - Rarely requires surgery



GI Issues in Early Onset Spinal Deformities

- Postoperative issues
 - Pancreatitis
 - Low threshold for evaluation
 - amylase/lipase
 - Conservative management
 - Follow CBC, Ca⁺⁺, glucose
 - Pain control
 - Uncomplicated pancreatitis can be managed with jejunal feeds



GI Issues in Early Onset Spinal Deformities

- Summary
 - Important to address nutrition
 - Evaluate well before surgery
 - Manage GER and constipation
 - Be aware of possible GI complications
 - Involve GI and nutrition