Bones and Crohn’s in the Pediatric Population

**Objectives**

- Understand the risk factors for and implications of diminished BMD in children with IBD
- Describe the evaluation of children at risk for diminished BMD secondary to IBD
- Summarize recommendations for screening and monitoring of bone health for children/teens with IBD

**Inflammation impacts bone health of patients.**

- Poor bone health and reduced bone mineral density (BMD) increasingly reported in children and young adults with IBD.
- Building a high peak bone mass during growth may be more important to future bone health and prevention of osteoporosis and reduced fracture risk reduction than efforts to minimize bone loss later in life.

(Hill, Brookes, & Davies, 2011; Ferrari, 2011)

**Risk Factors**

- BMD is often reduced in children with IBD
  - IBD affects bone health differently in children than adults
  - Many factors contribute to diminished BMD:
    - Inflammation
    - Lean mass deficits
    - Delayed growth/delayed maturation
    - Prolonged use of glucocorticoids
  - Peak bone mass is typically achieved by mid 20s; children with IBD are at risk of decreased peak bone mass

**Implications**

Studies have shown that bone mass is decreased in both adults and children with IBD.

*Estimates are 10–40% of children at the time of diagnosis of IBD have diminished bone mass.*

Children with IBD - more likely to have low BMD at the time of diagnosis than age matched, healthy controls. Rate of bone mineral accumulation - less than expected over 2 years.

(Dubner et al., 2009; Rufe et al., 2009; Schmidt et al., 2012; Sylvester et al., 2007)
DXA or DEXA scan – dual energy x-ray absorptiometry

- DXA is the preferred screening tool for children and adolescents with IBD, using a pediatric reference data set and reported as Z scores.
- Always use Z scores, not T scores. BMD results should be adjusted for absolute height or height age, or compared to pediatric reference data with age-, gender-, and height specific Z scores.

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- All children with IBD (who can lie comfortably on a cushioned table for 15 – 20 minutes) should have a DXA scan at presentation when practical.
- In children with linear growth delay, DXA results should be adjusted for size if the z score is < -1.0.

- Z score of <-2.0 SD = diminished or low bone mineral density for age, not necessarily osteoporosis.
- Z score of <-1.0 SD to -1.9 SD = suboptimal BMD
- A diagnosis of osteoporosis requires the presence of both a clinically significant fracture history and low bone mineral content or density.

- Children with IBD who have a low BMI for age, severe inflammatory activity, and low serum albumin are at high risk for diminished BMD.
- Z scores <-2.0 at any site suggest significant bone mineral deficit; consider additional screening labs, bone age film, and possibly referral to pediatric endocrinology.

- Decreased growth velocity, or height z score < -2.0 or crossing height, weight, or BMI percentiles downward
- Secondary or primary amenorrhea or delayed puberty
- Severe inflammatory disease course, (esp. if decreased albumin < 3)
- 6 months or longer continuous use of steroid

*** DXA scan at presentation of IBD when feasible

Risk factors – if present, strongly recommend DXA –
- Decreased growth velocity, or height z score < -2.0 or crossing height, weight, or BMI percentiles downward
- Secondary or primary amenorrhea or delayed puberty
- Severe inflammatory disease course, (esp. if decreased albumin < 3)
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(Pappa et al., 2011)

Nutritional assessment
- Laboratory studies – inflammatory markers, albumin, Vitamin D 25 OH
- Evaluate linear growth, growth velocity, and pubertal development. Consider bone age as well.
- pQCT – peripheral quantitative computed tomography

Goal of screening - to identify children at risk of clinically significant fractures

Management Guideline for Crohn’s Disease

- Baseline DXA at Diagnosis or Initial Assessment:
  - \( Z < 2.0 \) without fx
  - \( Z = -1.0 \) to \( -2.0 \)
  - \( Z > -1.0 \)

- Lifestyle measures:
  - Exercise, diet

- Optimize Vitamin D
  - Optimize Ca intake

- Repeat DXA 12 mos
  - Consider repeat DXA 24 months
  - No recommendation

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**Recommendations**

- Consider follow-up DXA scan every 1 – 2 years in children with IBD and BMD score of \(< -1.0 \) SD

- When BMD < -1.0, consider treating active disease/inflammation with steroid sparing therapy, including enteral nutrition, especially in those with delayed linear growth (height z score < -2.0)

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**Recommendations**

- Goal of monitoring – maintain/improve bone health in children with IBD (regardless of bone health status)
  - Comprehensive clinic at least annually to include nutritional assessment
  - Periodic evaluation of linear growth and pubertal development
  - Monitor vitamin D \((25 \text{OH})\) level and supplement as needed; repeat level as needed - maintain > 32
  - Evaluate for vertebral fracture if child has any symptoms, especially if they have a low BMD.

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**Case Presentation**

3/2010: A 13 YO African American female presenting to PCP for “buttock abscess” and found to be anemic.


6/2010: Seen by ENDO for short stature and delayed pubertal development. ESR 36. Bone age – delayed. Referred to GI to r/o IBD.

**Our recent experience**

- 2011 and 2012 through Sept – total 60 newly diagnosed with IBD (30 in 2011).
  - Average age 12.6 years; 50 % male/female. 43 have Crohn’s, 13 have UC, and 4 are IC.
  - 40 patients that we had DXA scan result within the first 6 months after diagnosis (most within 3 mo).
  - 8 patients (20%) had any z score \(-2.0\) or worse
  - 13 patients (32.5%) had z score between \(-1.0\) and \(-1.9\)
  - 19 patients (47.5%) had z score better than \(-1.0\)

**Bones and Crohn’s in the Pediatric Population**

- Control the underlying disease (minimize/avoid corticosteroid is probably wise)
- Optimize nutrition – calories, protein, vitamin D and calcium: consult pediatric dietitian
- Encourage physical activity
- Endocrine consultation ???

**Bones and Crohn’s in the Pediatric Population**

- Our recent experience

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**Case Presentation**

- 7/2010 – Seen by GI – noted low albumin from 4 months before (3.2) and presence of skin tag.
- Endoscopy confirms Crohn’s disease – esophagus, duodenum, TI, and patchy colitis noted.
- Started infliximab, Vitamin D/Calcium.
- 8/2010 - First DXA scan; Z scores -4.3, -5.3; per ENDO even adjusted for growth failure BMD was markedly diminished. No fracture history.
- Started Alendronate.

**Repeat DXA scan showed improvement in z scores but still with significantly diminished BMD:**

<table>
<thead>
<tr>
<th>DXA date</th>
<th>L spine SD</th>
<th>whole body SD</th>
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<tbody>
<tr>
<td>August 2010</td>
<td>-5.3</td>
<td>-4.3</td>
</tr>
<tr>
<td>August 2011</td>
<td>-3.2</td>
<td>-3.5</td>
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- 11/2011 - started pamidronate infusions
- Currently on infliximab 10 mg/kg every 6 weeks and doing well.

**Summary**

Children with IBD are at risk for poor bone health independent of steroid exposure.

Maximizing nutrition to promote linear growth and pubertal development as well controlling inflammation are key in promoting bone health.

Careful assessment of bone health and risk factors for diminished BMD is important - at time of diagnosis, and ongoing monitoring and intervention as necessary.

**Bibliography**

Bibliography