Puberty and Growth in Duchenne MD

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Boys’ Growth Charts
Representative Growth of Boys with DMD non ambulatory – no steroids
How to measure height in a nonambulatory child?

- Arm span?
- Forearm (Ulnar) length?
- Tibia length?
- Segmentally measured (joint to joint)?

- No method has been validated in nonambulatory children
- Pick a method and stick to it! (I like arm span)
Representative Growth of Boys with DMD, ambulatory, on steroids
Why is growth attenuated and obesity so common?

- Corticosteroids (Prednisone, Deflazacort)
- Lower metabolic rate and calorie use leading to weight gain/obesity
Does Growth Hormone Help?

“Until more evidence is available, the routine use of rhGH to treat DMD-related growth failure is not recommended. Instead, the decision to treat with rhGH should be based on a thorough discussion about the potential risks and benefits of the therapy.”
What about growth hormone and muscle strength?

- No trials have been performed in boys with DMD
- In children, no data on GH effect on muscle strength
- Cost: 30000-50000/year
Delayed Puberty

Typical Puberty in Males

Typical Order of Events
1. Increase in testicular size
2. Hair Development (Adrenarche)
3. Peak height velocity
4. Voice changes, facial hair


# Puberty in boys vs boys on corticosteroids

## Puberty in Males

<table>
<thead>
<tr>
<th>Height spurt</th>
<th>Testicular volume (cc)</th>
<th>Penis (Tanner Stage)</th>
<th>Pubic Hair (Tanner Stage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-9</td>
<td>4-6</td>
<td>2</td>
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<tr>
<td>10-11</td>
<td>6-10</td>
<td>3</td>
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<td>12-13</td>
<td>10-15</td>
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<td>14-15</td>
<td>15-25</td>
<td>5</td>
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Later, Longer
Delayed Puberty – Growth Chart (ambulatory boy without DMD)
Delayed Puberty – Why does it happen?

Brain → GnRH → Pituitary → LH and FSH → Testes → Testosterone

Corticosteroids → X → GnRH
Evaluation for Puberty

- Pubic Hair may not indicate puberty!
- First sign is testicular enlargement to 4 mL or greater
  - Must feel comfortable assessing testicle size
  - Must have time/patient willingness to maneuver wheelchair and position in chair for exam
- Early puberty is a night-time process!
  - Only morning levels (< 10AM) of testosterone are helpful
  - Use sensitive testosterone (by LC/MS assay)
Delayed Puberty - Treatment

• “In an attempt to mimic normal pubertal development, testosterone replacement should be initiated at a low dose”
  • DMD Care Consideration, 2017

• When to start? After age 14 and when AM testosterone level < 75 mg/dL
• What dose? Start low, increase slowly
  – 50 mg IM monthly, increasing every 4-6 mos by 25 mg. Once reach 100 mg/month, switch to twice monthly
• When to stop? ???????
Benefits of Testosterone

- Positive effects on bone mineral density
- Positive effects on muscle mass/strength
- Positive effects on psyche

- Drawbacks: Monthly injections, barriers to obtain testosterone.
Questions?