ORTHOPEDIC COMPLICATIONS OF OBESITY IN CHILDREN AND ADOLESCENTS

Valorie Thomas APRN, BC
Children’s Mercy Hospital
Division of Orthopedic Surgery
OBJECTIVES

- Describe the most common musculoskeletal consequences in overweight children
- Describe the indirect effects of childhood obesity
- Describe the spiral effect of musculoskeletal pain and ability to exercise
- Identify tools and activities that can be used in building a regular exercise routine for overweight children
DISCLOSURES

• I have no disclosures.
Orthopedic complications of obesity in children

• As the unhealthy epidemic of childhood obesity is increasing, so are the orthopedic complications.

• Fractures, musculoskeletal pain, lower extremity malalignment, and impaired mobility are more prevalent in overweight than non-overweight children and adolescents.

• The orthopedist treating an overweight child, not only has to be concerned with the effects of childhood obesity on the growing skeleton, but other significant health problems as well.

• Evaluate general health status as well as specific orthopedic conditions/issues.

• An obese child being seen in orthopedics, may have a syndrome or some other co morbid condition that has not yet been diagnosed, such as Cushing's, hypothyroidism, growth hormone deficiency, pseudo hypo parathyroidism, Prader Willi, Klinefelter, Bardet-Biedl syndrome. (Hayashi, 2009)

• Indirect effects of childhood obesity will develop into more direct, serious conditions as these children reach adulthood including arthritis, back pain, and hip and knee replacements.
Orthopedic complications of obesity in children

• Childhood obesity and orthopedic problems are also associated with endocrine factors.

• In a study by Benjamin Alman, MD, it was found that half of obese children had low enough vitamin D levels with some bone health effects as well as a high rate of thyroid hormone dysregulation.

• Due to obesity or diet?

• Alman suggested that poor diet and inadequate calcium intake may slow the growth plate.

• Additionally, insufficient vitamin D levels and inappropriate amounts of leptin may inhibit growth plate from normal development.

• Abnormal hormone levels associated with obesity such as hypothyroidism and Prader-Willi syndrome, may also predispose the obese child to certain orthopedic conditions

Hayashi, 2009
Slipped capital femoral epiphysis, SCFE

More than 85% of US kids with SCFE are overweight. Most common adolescent hip disorders and one of the most challenging to treat.

Studies have report an association between rise in obesity with increased incidence of SCFE.

Disorder of the growth and development of the upper femur.

Metaphysis of the femur displaces from the physis (picture a scoop of ice cream that slips off the cone!)

Most commonly presents in males, obese, periods of rapid growth (just after onset of puberty), typical presentation is history of weeks or months of gradual onset groin, thigh or knee pain &/or limp.
LEFT SCFE
TREATMENT FOR SCFE

- Treatment is always surgery

- Stable vs unstable slip influences method of treatment

- Traditional treatments of one percutaneous screw across the growth plate may not prevent slippage of the epiphysis in the obese child.

- Open reduction vs fixation in situ

- Risks: AVN (avascular necrosis), chondrolysis, loss of articular cartilage to hip joint causing stiffening of joint, loss of motion, flexion contractures and pain.
RECOVERY AFTER SCFE SURGERY

- 6 weeks touch down weight bearing on affected side with crutches or walker, wheelchair for distance.
- 6 weeks full weight bearing as tolerated, no sports
- Depending on healing, pain and motion, activity advanced as tolerated after 3 months.
- NO sports until physis is closed.
IMPLANT COMPLICATION
**BLOUNT’S DISEASE**

- Blount’s is also known as pathologic tibia vara.
- Infantile or early onset and Adolescent or late onset.
- Infantile Blounts has an age of onset between 1 year and 3 years: More likely to be discovered in early walkers and more common in African American population.
- More exaggerated in heavier children.
- Must differentiate between physiologic genu varum and actual Blounts.
- Not a congenital deformity but a developmental deformity of the proximal medial tibial physis.
- Etiology unknown.
- Mechanical overload of the medioproximal tibial physis.
- Bracing has been the traditional first line treatment as mechanical unloading of the medial physis, although natural history suggests bracing has no advantage over observation.
- Corrective osteotomy for children who do not have spontaneous correction by age 4 years.
ORTHOpedIC COMPLICATIONS OF OBESITY IN CHILDREN

• Treatment for orthopedic conditions in the obese child requires a complete history and physical examination.

• If surgical intervention is indicated, preoperative screening for sleep apnea, hypertension and diabetes.

• Study by Dr. Todd Milbrandt MD of Shriner’s Hospital in Lexington, KY looked at BP of patients diagnosed with Blount disease scheduled for surgery.

• BP was in the normal range in only 18% of patients, 25% were stage II hypertensive.

• Also demonstrated a direct correlation between patient’s BMI and blood pressure, consistent across all age groups.
GENU VARUM OR “BOWED LEGS”
Physiologic genu varum

- Varus deformity present in femur and tibia to varying degrees
- Can be severe
- Spontaneous resolution around age 2-4 years
- Usually bilateral
Blount's Disease

- Radiographic features include varus at epiphyseal/metaphyseal junction
- Widened irregular medial physis
- Medial sloping of epiphysis
- Beaking of medial metaphysis
**Blounts Disease**

- Similar to physiologic bowing
- Often obese and exceeds 95\textsuperscript{th} % for weight
- Lateral thrust during stance phase-varus instability of joint
Adolescent Blount’s

- Generally obese but can more difficult to detect due to size - mild pre-existing varus?
- More common in African American
- May reflect mechanical overload on medial physis.
- Can occur as later onset or possibly mild Blounts that progresses.
- More common to have unilateral deformity.
ADOLESCENT BLOUNT’S

• Treatment is osteotomy
• Acute vs. gradual correction
• Surgical correction with Taylor Spatial Frame
ADOLESCENT BLOUNT'S
KYPHOSIS

- Abnormal rounding of the upper back, measuring > 50 degrees.
- Can be related to posture, vertebral anomalies, obesity, Scheurmann’s disease, tumors, infection, Spina bifida, osteoporosis and arthritis.
- With obesity, more back pain.
- Obesity makes it difficult to brace.
PRE AND POST SPINE SURGERY FOR KYPHOSIS
• Peak fracture incidence in childhood coincides with periods of rapid growth.

• Metaphyseal/diaphyseal density ration is lowest during this time.

• “A dissociation between longitudinal growth and mineral accrual increases bone fragility and alters bone quality and micro architecture”. Wills, Mary PT, DHS, OCS

• Obesity during this time when bone development does not adequately cope with excess weight, may increase the likelihood of fractures during falls.

• Weight and bone mass imbalance also places high stress on growing bones and joints leading to joint damage and possibly contributes to osteoarthritis in later years.
FRACTURE RISK

• Study to determine factors that influence fracture risk in young girls compared to 100 girls age 3-15 years who had recent traumatic forearm fracture compared with a group of 100 who were fracture free.

• Results demonstrated that low total body bone mineral density, high body weight, and previous fractures each independently increased the risk of new fractures in a growing child.

Wills, 2003
Another study by Taylor MS III found that overweight children report a significant impairment in mobility compared to non overweight children.

Overweight male adolescents were reported to have poorer balance than healthy weight adolescents, increasing their risk of falling, have more difficulty with halting forward progress when they begin to fall, and have increased weight related force applied to the bones, increasing their risk for fracture.
FRACTURE RISK

• Study completed to evaluate flexible nailing of femur fractures in children shows that postoperative complications increase significantly with increased BMI

• Complications include wound infections, nonunion of fractures, skin ulcers, nerve palsy, and re-fracture requiring further surgery. (Weiss et al, 2008)

• Obesity can also cause complications with effective splinting and casting for fractures, present mobility problems with lower extremity fractures, and create difficulty in implant choice for surgical treatment. (Hayashi, 2009)
Lower extremity alignment was studied in 250 youth who gave self reported joint complaint, most common being knee pain. 21.4% overweight vs 16.7% non overweight.

Overweight children also reported greater impairment in mobility than non overweight (mobility score: 17.0 vs 11.6)

Metaphyseal-diaphyseal and anatomic tibiofemoral angle measurements showed greater malalignment in overweight compared to non overweight children.

Findings in this study were unclear of clinical significance however it has been hypothesized that a combination of malalignment and excess weight may contribute to musculoskeletal pain and decreasing level of physical activity.
Musculoskeletal pain

• Orthopedic specialists commonly see overweight children complaining of hip, back, knee and foot pain.

• Foot pain in the obese child is not uncommon.

• Overweight children tend to have increased foot length and width, decreased navicular height, lower medial arch height, and higher plantar pressure compared to normal weight children. (Krul et al, 2009)

• Dr. Blaise Nemeth, orthopedist at UW Pediatric Fitness clinic describes several of his obese patients with a rigid idiopathic flat foot, previously described by Perry Schoenecker, MD and Scott J. Luhmann, MD, as a “rigid foot that is negative for any type of coalition or other cause.” (UW Newsletter 2009)

• May be sequela of obesity and increased pressure on the foot with midfoot breach and tight Achilles tendon.
Must also consider how obesity contributes to perioperative complications.

Milbrandt also presented data on complication rates following scoliosis surgery in adolescent girls.

Overweight and obese patients had 70% complication rate.

Most common complication was persistent wound drainage.

Also, heavier girls had significantly longer surgical times and hospital stay.

Epps, 2012
ORTHOPEDIC COMPLICATIONS OF OBESITY IN CHILDREN

• Because fractures, musculoskeletal discomfort, impaired mobility and lower extremity malalignment are more prevalent in overweight children, may affect the likelihood that they will engage in physical activity at all, much less team sports, gymnastics, etc.

• Part of the cycle that perpetuates excess weight gain in children.
• Clinicians who work with children and adolescents must understand the orthopedic consequences of obesity.

• Clinicians including orthopedic surgeons and APRNs have the opportunity to intervene to treat and educate patients.

• A multi-disciplinary approach should be considered.

• Orthopedic complaints found in overweight children and adolescents, hinders their mobility and tolerance for physical activity.

• For children that are struggling with weight problems, pain and coordination, try using tools such as physical therapy, orthotics and recommending low impact activities like swimming, yoga, stationary bicycling

• Incorporate fun and family to build a fitness ethic!
• Fitness must be ingrained in kids as they are developing that become habits and will stick with them the rest of their lives.

• Being healthy and fit is hard work!
THANK YOU!