

Title: Walking Tall

Group members (contact info optional): Linda Woody, Sarah Kaneko, Lisa Siegerman

Target Audience: Honors Anatomy and Physiology 11-12, also can be adapted for Biology 9-12.

Objectives: Students will explore the change in morphology of quadruped verses bipedal primates.

North Carolina Standard Course of Study:

Competency Goal 1: The learner will develop abilities necessary to do and understand scientific inquiry.

Competency Goal 3.05: Examine the development of the theory of evolution by natural selection.

Competency Goal 4.03: Assess, describe and explain adaptations affecting survival and reproductive success.

Description of project: video clip introduction, hands on experience of the changes in morphology, a case study.

Specific activities:

- Have already discussed axial and appendicular skeleton and bone development
- Show 56 sec. Video clip  
[http://www.pbs.org/wgbh/evolution/library/07/1/1\\_071\\_02.html/](http://www.pbs.org/wgbh/evolution/library/07/1/1_071_02.html/)
- Break up into groups of 3's to do an inquiry lab
  - Templates of human and chimpanzee feet
  - Students will make a set per group from felt, cotton balls and staples
  - Each group member will have a role- timer, performer and recorder
  - Students have an obstacle course with hula hoops and arrows to show them to go side to side and upwards and be timed in each set of feet puppets.
  - Then time a speed walk for 25 yards and test both sets of feet puppets
  - Collect group's data and class data
  - Analyze data and write a 3 paragraph summary of your analysis
- Case study:

Case Study: Symptomatic Bunion Deformity

By John Harris, DPM, Foot and Ankle, Grand Rapids

25-year-old female presents to mmpc with Foot & Ankle pain to her left 1st metatarsalphalangeal joint (MPJ). Pain is consistently 5 out of 10, and increases as activity increases. The patient describes the pain as throbbing and aching. Pain is worse at the end of a workday and after activity. The patient has tried larger toe box shoes and orthotic devices to no avail.

#### Physical Exam:

The patient is a healthy 25 year-old female. She has a gross bunion deformity to the left foot. There is pain with palpation to the medial aspect of the 1<sup>st</sup> metatarsal head (medial eminence) and with range of motion of the 1st MPJ. The patient also has erythema to the medial eminence.

**ASK STUDENTS:** to decide what tests they want to perform. Then teacher gives results . Then have students decide on form of treatment. Discuss treatments and how this can be prevented for future humans.

#### Actual Treatment:

For a two month time period the patient attempted conservative treatment consisting of wider toe box shoes and pre-fabricated orthotic devices. This treatment improved overall foot comfort, but did not eliminate pain to the left 1st MPJ. The decision was made to proceed with surgical management. A distal bunionectomy was carried out. Post-operative course consisted of 4 weeks weight-bearing to her heel in a surgical shoe. The patient is currently 4 weeks post-op (Fig. 4) and returning to activity and normal shoe gear as tolerated. Some edema remains (normal post-op course) and normally will resolve as the patient returns to normal activity.

#### Discussion:

Bunions or hallux abductovalgus deformity is not a growth of bone out of the side of the foot. It is however an osseous malalignment of the 1st metatarsal phalangeal joint. The most prevalent etiology is hyperpronation of the foot. This is why wearing orthotics devices in the shoes may slow down its progression, but will certainly not reverse it. Addressing the joint malalignment and prominent 1st metatarsal is accomplished best with surgical correction. Pain is certainly encountered post-operatively, but is well controlled by mouth pain medications.

References: Michigan Medical Podiatry College  
North Carolina State University  
PBS

Materials: felt, cotton balls, staplers, hula hoops, timers, poster board templates, computer, projector