

Case Report

By: Victoria Prokic

Introduction

The NYPD has been receiving tons of missing person reports within a week. They had no leads until they received a call from a couple who claimed to have found a “dumpster full of bones”. The couple went through an alley late at night and saw a man throwing a few trash bags into the dumpster. They approached the man in need of directions to the closest restaurant. As soon as the couple got close, the man panicked and fled the scene. The couple was curious as to what he was hiding. They looked inside the dumpster and saw open trash bags full with bones. When NYPD arrived at the scene, they began to look through each bag. There were a total of 20 bags and 19 of them contained almost the full skeleton. One bag was found to only contain a skull, femur, humerus, and pelvis. These bones are just enough to identify the person’s gender, ethnicity, age, and height.

Summary of Findings

The most accurate bone to use to determine the sex of the person was the pelvis. The pubic cavity was more heart shaped, showing the sacrum and coccyx. The angle of the greater sciatic notch was found to be less than 68 degrees and the sub-pubic angle was found to be 90 degrees. Both of these results led to the determination that the person these bones belonged to was a male because the pelvis was not wide enough for childbirth.

The skull was used to determine the ethnicity of the individual. Using the nasal width and nasal height measurements, the nasal index was found to be less than 0.48. It was also observed that there is nasal sill. Both of these results lead to the determination that these bones matched that of a white individual.

The pelvis and femur were the most helpful in determining the age of the individual. In the pelvis, the two lowest segments of the sacral vertebrae were joined together. On the femur it was observed that the head, greater trochanter, and lesser trochanter first join the shaft. Both of these observations lead to the decision that the person was 18 years old.

Substituting in the maximum length of the femur into the equation for a white male led to calculating the height range of 161.35 cm to 169.23 cm. Substituting in the maximum length of the humerus into the equation for a white male led to calculating the height range of 163.12 cm to 172.26 cm. Using both of these ranges, the average minimum value was 162.24 cm and the average maximum value was 170.75 cm. This is equivalent to a height range of 5'3" to 5'6".

The inconsistencies in the data were in the age determination. Although two observations led to the age of 18, the humerus may have pointed to the approximate age of 20 due to the upper epiphysis uniting with the shaft. Observing these bones for age determination was difficult due to our lack of experience. Seeing different bones of each approximate age before examining the bones of our person would've been helpful.

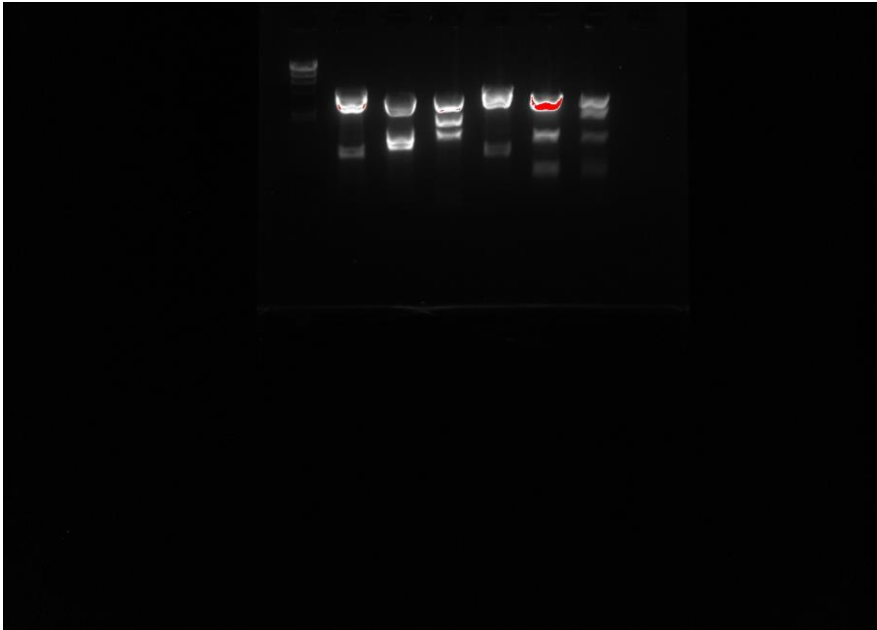
Further Analysis

Facial reconstruction is a method used to aid in the identification of skeletal remains. The reproduction of the facial features on the skull is based on the average soft tissue thickness based on sex and ethnicity. Being able to rebuild facial features may give a better idea of what the person looked like. This can help authorities compare it to pictures of missing people and also have families of missing people see if they can identify the face. Another test that can analyze bones is the process of carbon dating. Carbon dating is a very useful test that can determine how old the bones are. Also, the length of the radius can be substituted into an equation to determine the height of an individual.

DNA Analysis

After determining the sex, ethnicity, approximate age, and approximate height, DNA samples found in the bones are analyzed and compared to the DNA of the missing people. Polymerase Chain Reaction (PCR) copies and replicates the small amount of DNA. Restriction enzymes were used to cut the DNA in specific locations. The pieces left behind after being cut by the restriction enzyme can be separated and compared using the process of gel electrophoresis. As the pieces move, their different lengths send them through the gel at different rates of speeds. These Restriction Fragment Length Polymorphisms (RFLP's) are used to create a DNA fingerprint. This DNA fingerprint provides key information about human identity, and in this case it will help identify what missing person the discovered bones belong to. The following picture shows the result of the gel electrophoresis.

Image Report: Gallagher, Brendan 2015-04-15 11hr 19min



Acquisition Information

Imager	Gel Doc™ EZ
Exposure Time (sec)	0.697 (Auto -Intense Bands)
Application	SYBR Safe
Dark Type	Referenced
Ref. Bkgd. Time (sec)	10
Flat Field	Applied
Serial Number	735BR02026
Software Version	4.1
Illumination Mode	Blue Transillumination

Image Information

Acquisition Date	4/15/2015 11:19:22 AM
User Name	Gallagher
Image Area (mm)	X: 150.0 Y: 107.8
Pixel Size (um)	X: 107.8 Y: 107.8
Data Range (Int)	0 -4095

Analysis Settings

No analysis performed

As you can see, there are 6 lanes in the gel electrophoresis. The first is the DNA extracted from the bones and the last 5 are DNA from missing persons 1-5. It is observed that lane 1 and 4 match. This means that the DNA from the bones is the DNA of missing person number 3.

Conclusion

The gel electrophoresis showed that the DNA found in the bones matched that of missing person 3. Missing person number 3 is Justin Bendis. Justin is a 23-year-old white male who is 5'4". Measurements and observations of the recovered bones led the conclusion that they belonged to a white male. Using the maximum length of the femur and humerus, the approximate height range was calculated to be 5'3" to 5'6". Observations of all the bones led to approximating the person to be 18 years old. Since the age wasn't close enough to Justin's age, I recommend that the police continue looking for the rest of the skeletal bones to hopefully help predict a closer age. I also recommend that a professional do a facial reconstruction over top of the skull and compare the face to a picture of Justin Bendis.