Study: Roller coasters linked to common ear injury

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The sharp turns, ups and downs, and high speeds of today's roller coasters bring a lot of thrills, but if you're not careful, the ride could also cause damage to your ears, say physicians at Henry Ford Hospital in Detroit.

Their case study offers the first reported link between the force of acceleration in roller coasters and a common ear injury - ear barotrauma - that occurs when there is a relatively quick change in pressure between the external environment, the ear drum and the pressure in the middle ear space.

In its extreme, ear barotrauma can lead to temporary hearing loss, and most commonly causes dizziness, ear discomfort or pain, or a sensation of having the ears "pop." Since barotrauma from a roller coaster happens suddenly, it very difficult for the patient to equalize ear pressure by simply yawning or chewing gum.

"As roller coasters continue to push the envelope of speed, otolaryngologists need to be aware of this new cause of barotrauma to the ear," says study senior author Kathleen L. Yaremchuk, M.D., Chair, Department of Otolaryngology at Henry Ford Hospital. "Based on our research, we recommend that passengers remain facing forward for the duration of the ride to not let the full impact of acceleration hit the ear."

Previously, ear barotrauma has been linked to air travel and scuba diving, and most recently to the improvised explosive devices or IEDs

being used in Iraq and Afghanistan.

Results from the study will be presented April 30 at the Triologocial Society's 113th Annual Meeting, part of the Combined Otolaryngology Spring Meetings in Las Vegas.

Henry Ford's study into roller coaster-induced ear barotrauma is centered on a 24-year-old male who experienced pain and fullness in his right ear about 36 hours after riding a roller coaster at a local amusement park.

As the ride began to accelerate, the patient's head was turned to the left to speak with his girlfriend, causing his right ear to sustain full impact of the forward throttle. The roller coaster he was riding reaches a maximum speed of 120 mph within 4 seconds.

When examined by Henry Ford otolaryngologists, the patient's left ear was normal; however, the right ear canal was swollen and the ear drum inflamed.

Upon further examination, Dr. Yaremchuk and co-author Samer Al-khudari, M.D., estimated that the patient's right ear was exposed to about 0.6 PSI (pound per square inch, used to measure pressure) when the roller coaster accelerated. While not enough to perforate the ear drum, the pressure was enough to cause barotrauma to the ear.

External pressure or compression can cause inflammation in the ear, leading to increased swelling and redness. For example, approximately 0.62 PSI is required to cause capillary closure in arterioles (the small thin-walled arteries that end in capillaries) of human fingers.

For the patient in this study, his symptoms improved, with observation, within 72 hours. With most cases of barotrauma, otolaryngologists

typically recommend patients take decongestants to relive symptoms, and that they not put themselves in the same situation that caused the barotrauma until the inner/middle ear swelling has decreased.

But roller coaster enthusiasts should not let the risk of ear barotrauma prevent them from enjoying the ride.

"This was an unusual situation, where the rider turned his head at just the right time to experience the full force of acceleration against his ear drum. It would be highly unlikely to do this multiple times in a row, but roller coaster riders should be aware of what they can do to prevent barotrauma from occurring," says Dr. Yaremchuk.

Provided by Henry Ford Health System