Katie Dragnev

STEAM project

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**Gomphosis. A fibrous joint**

For my STEAM project I chose to create a graphic novel based on course objective : Types of joints.

There are several types of joints in a human body, with most common to be a synovial joint, however for my research I chose a fibrous joint named Gomphosis. It is one of the kind joint. It is a peg-and-socket joint that attaches roots of the teeth to their bony sockets. The word itself derives from a Greek word ‘gomphos’ which means bolt. The root of the tooth is ‘bolted’ into a bony socket and is very limited on movement. However , a very limited movement is still possible because of periodontal ligaments which consists of Dense Connective tissue. That tissue connects the top layer of the root of the tooth called ‘cementum’ to the top layer of the bony socket called ‘lamina dura’. This Dense Connective tissue mainly consists of collagen fibers. These fibers attach tooth to the bone. That is why Gomphosis is a fibrous joint. Again ,these specific fibrous bundles of connective tissue are called ‘periodontal ligaments’. To describe the structure of Gomphosis we can finalize that it consists of a bony socket, root of the tooth and a periodontal ligament in between them (Natalie L. Andras, “Between a rock and a hard place. Regulation of mineralization in periodontium . Summary”) .The periodontal ligament plays a very important role here. It allows the tooth some mobility, which we know is possible due to the existence of Orthodontistry (braces). The overall Gomphosis functions are to: provide tooth attachment, distribute forces, nourish and invest teeth via neurovascular elements. According to the James’s E. McIntosh article “Caiman Periodontium as an Intermediate Between Basal Vertebrate Ankylosis-Type Attachment and Mammalian “True” Periodontium “, mammals (including us humans) are fortunate to have Gomphosis joint because it helps to ‘tune ‘ each tooth to its perfect position. That factor plays a role in the ability to resist mechanical stress and other challenges. Non-mammalian vertebrates for example do not poses gomphosis. They have a fixed connection between jawbone and teeth called ‘ankylosis’. Lack of ligaments there compromises teeth at a greater level.

As of an explanation of my art project form I would like to add that while brainstorming the ideas of how to present Gomphosis in an art form, I pictured a scene of a tooth extraction procedure. That procedure creates a good base for explaining the structure of this type of joint, because a doctor will extract the root/roots of the tooth out of the socket and break down all ligaments associated with it. Which means that this particular dental procedure is directly triggering Gomphosis. It is common that a patient might need an extraction once a severe inflammation due to periodontal disease is quickly progressing and the joint is no longer capable of its functions (Sunita P. Ho “ The tooth attachment mechanism defined by structure, chemical composition and mechanical properties of collagen fibers in the periodontium” ). But because extraction procedure can be considered relatively traumatic for people, I decided to do it in a humorous way to lessen some tension.

**References**

**1.**McIntosh, J. E., et al. “Caiman Periodontium as an Intermediate between Basal Vertebrate Ankylosis-Type Attachment and Mammalian ‘True’ Periodontium.” *Microscopy Research and Technique*, vol. 59, no. 5, 2002, pp. 449–59.

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**2.**Ho, S. P., Marshall, S. J., Rider, M. I., & Marshall, G. W. (2007). ​​​​​​​​​​​​​The tooth attachment mechanism defined by structure, chemical composition and mechanical properties of collagen fibers in the periodontium.  *Biomaterials*, *28*(35), 5238–5245. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S0142961207006758?via%3Dihub.

**3.**Diekwisch, T. G. (2016). Our periodontal tissue: a masterpiece of evolution. *Clinical Periodontology*, *43*(4), 320–322. Retrieved from <https://onlinelibrary.wiley.com/doi/full/10.1111/jcpe.12532>.

**4.**Andras, N. L., Mohamed, F. F., Chu, E. Y., & Foster, B. L. (2022). Between a rock and a hard place: Regulation of mineralization in the periodontium. *Genesis*, *60*(8–9). Retrieved from https://onlinelibrary.wiley.com/doi/10.1002/dvg.23474.

The link for my art project at STEAM website:

https://humanap.community.uaf.edu/2023/11/19/gomphosis-a-fibrous-joint/