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| **Name:** |
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| 4B-1 |
| **Pathology Question:** |
| How does bone resorption differ in the maxilla compared to the mandible?  |
| **Report:** |
| Bone resorption in the mandible and maxilla differs in three primary areas: amount of reduction, rate of reduction, and location of reduction. The reasons behind these differences center on the type of bone in the mandible and maxilla, along with the forces applied to each arch. In health, bone resorption takes place during the process of bone remodeling. Osteoclasts break down bown, whereas osteoblasts build it back. This is done in response to different stimuli. In the mouth, a tooth would provide that stimuli everytime pressure is placed on the tooth. Bones are strengthened by these types of physical stimuli. Problems begin to occur when the tooth is removed. The stimulus is lost and osteoclasts spend more time breaking down bone than osteoblasts spend time building bone. This is called bone resorption. The maxilla and mandible respond differently to this event (Samyukta). While there is high individual variation in bone resorption, the maxilla has more cancellous bone. Cancellous bone is more able to absorb force and dissipate it leading to less resorption in the maxilla than the mandible. However, the maxilla also houses the maxillary sinus. When teeth are removed in areas adjacent to the maxillary sinus, there can be a pneumatized maxillary sinus. A pneumatized sinus is caused by atrophy of bone around the sinus due to a lack of occlusal pressure. As a result, the maxillary sinus widens and there is less bone in adjacent area (Mital). Dentures are also capable of accelerating bone resorption (Mital). However, bone resorption occurs differently in the maxilla compared to the mandible. This is because of the dispersement of occlusal forces. The maxillary denture area is 4.2 square inches, whereas the mandibular denture area is 2.3 square inches on average. The denture ratio is 1.8:1. This means any given point on the maxillary denture would experience less force compared to the mandibular denture. If a patient bites with 50 lbs of force, the maxillary denture would only experience 12 lbs per sqare inch rather than the mandibular which would experience 21 lbs of force per square inch. Additionally, the maxilla has the hard palate and its periosteum to distribute the force (Samyukta). Ultimately this leads to the following differences in bone resorption in the maxilla and mandible. A majority of the bone resorption occurs in the first year for both bones. During this time, the mandibular ridge will reduce twice as much as the maxillary. After seven years of resorption, the mandible will resorb four times as much as the maxilla. Amongst complete denture wearers, the mandible will resorb twice as fast as the maxilla. However, the anterior mandible will resorb at four times the rate of the anterior maxilla. This is likely due to the shock absorbing effects of the palate and the wider surface area of the maxillary denture (Samyukta). Finally, there are differences in the location of bone resorption in the mandible and maxilla. The maxillary arch loses bone evenly around the dental arch. However, it loses more on the buccal or labial side than the palatal. Whereas the mandibular arch will lose bone in both the labiolingual direction and the vertical direction. The mandibular arch is also more prone to losing bone in the distal part of the arch (Samyukta).While both the mandibular and maxillary arch are prone to resorption as patients age and lose teeth, the amount of absorption is mediated by anatomical factors along with impact of interacting with dentures. Furthermore, there are a number of systemic effects that can influence bone loss that are not specific to bone resorption as a consequence of tooth loss. |
| **References:** |
| Mittal, Yuvika et al. “Bone manipulation procedures in dental implants.” *Indian journal of dentistry* vol. 7,2 (2016): 86-94. doi:10.4103/0975-962X.184650Samyukta et al. Residual Ridge Resorption in Complete Denture Wearers. J Pharm. Sci & Res. Vol 8(6), 2016, 565-569. |