Discussion of Dr. Thompson's Paper

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It occurred to me, after reading Dr. Thompson's paper in which he very carefully discusses the external conformation and the biological principles of the alveolar process, that I might add something to his findings if I made an analysis of the support that this bone offers to the teeth.

Sometime ago I made sections of the maxilla and mandible of a normal adult occlusion. From this I found out several things that I would like to add to Dr. Thompson's report. Probably the most striking thing is the marked qualitative difference of the bone structure of the two alveolar processes. In the maxilla the cortical plate is thin, measuring from ½ to 1 mm. The cancellous bone is quite dense and composed of heavy plates. In the mandible the opposite is true, the cortical plate being about twice as heavy as that of the maxilla and the cancellous bone noticeably more delicate. In both processes there is also a beautifully systematic architectural arrangement of the cancellous bone, the analysis of which would be a study in itself.

Quoting Cope on "Mechanical Cause of the Development of the Hard Parts of Mammalia," Dr. Thompson says, "Their present forms are adaptations to physical environment." I take this to mean phylogenetically and that it gives the characteristic form and size to each species and specifically to the alveolar processes. This gives us a human pattern. Ontogenetically, the detailed development of this pattern is dependent upon physical environment and function. If these statements, which are generally accepted, are true, it follows that the alveolar process varies, in its relationship to the teeth, with function and with the type and degree of malocclusion. A study of this problem with the human jaws should be very illuminating. Obviously Dr. Thompson's description has been of the normal.

He states in his paper that the alveolar process is built upon the bodies of the maxillae and mandible for the express purpose of holding the teeth in position. In interpreting the stresses upon the teeth we find that in normal occlusion and function there are resultants of forces in varying directions so that no tooth transmits the entire load in a line with its long axis. These resultants of forces are produced by two main factors, the relationship of the long axes of all opposing teeth and the functional muscular forces active in deglutition and in malocclusion. On the mandibular teeth we note that, in the

normal, the resultants of these forces are depressing, lingual and mesial in their direction while in the maxillary teeth they are depressing, labial and mesial. These forces are resisted by bone and musculature.

The alveolar process does not resist pressure in the same manner as a foundation of a building. A tooth is suspended by the several groups of principal fibers of the peridental membrane which are histologically white

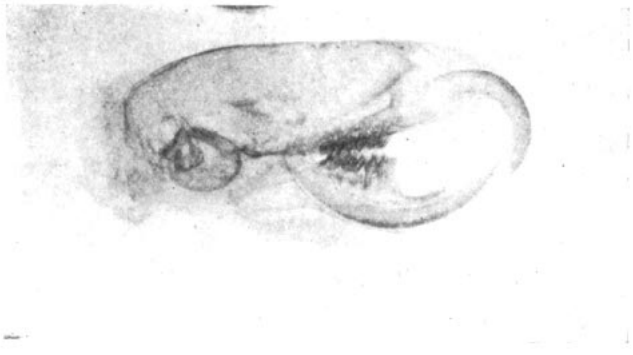

Figure 1

fibrous connective tissue. Any movement of a tooth is resisted by an increased tension of some fibers and a relaxation of their opponents. Being non-elastic tissue, a pull of the fibers is transmitted directly to the bone in which they are embedded. No positive compression can take place between tooth and alveolar wall unless there is tearing of the fibers on the opposite side.

The time for this discussion will not permit a complete correlation of Dr. Thompson's excellent description with this short analysis. You are familiar with the usual thinness of the buccal plate over the upper incisors. It is hard for me to believe that this offers sufficient mechanical resistance to the stresses of mastication. I am of the opinion that the alveolar process supports the teeth by offering resistance to the pull of the peridental membrane. For evidence, one often has to look beyond the material under discussion. I believe that it can be found in the white rat. Fig. 1. The incisors of the rat are definitely procumbent and an analysis of the resultant of forces shows them to closely approach a vertical direction to the long axes, particularly in the mandibular incisors. We find an almost total lack of bone and a complete absence of peridental membrane on the labial side, the side of pressure. On the lingual aspect which is the side of pull, there is an abundance of bone and a well developed membrane.

I wish to thank Dr. Thompson for his paper. Anything that throws more light upon the alveolar process is important.