

**Histopathological Findings of the Sinus Membrane after Sinus Lift
Surgery in Animal Experiments**

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Objective : Thread-like or sheet-like structure (Fig.1) of the sinus membrane after sinus lift surgery has been observed frequently in a series of our animal experiments using dog's frontal sinuses^{1, 2)}. This is an ongoing study investigating the pathological findings of the thread-like structure to confirm how to form it.

Materials and Methods : Histological specimens of 66 frontal sinuses in 33 dogs with sinus lift surgeries from previous studies were investigated. The frontal bone was exposed after making an incision in the skin with periosteal membrane. Bone windows on both sides of the frontal sinus were opened. Through the bone windows, the sinus membrane was lifted in 63 cases and removed in 2 cases. Implant placement without lifting the sinus membrane was performed in 1 case. Collagen sheet (COLATAPE™) was placed under the lifted membrane in 7 cases. Dental implants (Brånemark implant, Novel Biocare) were placed beside the bone windows in 41 cases and titanium screws in 4 cases. Then, in 50 cases, bone substitutes were used to fill the space under the lifted membrane as follows; collagen sponge (KOKEN or PLETAFORM™), bovine bone granules (KOKEN), bovine bone granules with collagen gel (BoneJect™, KOKEN), autogenous bone granules or block, bovine bone with collagen gel (KOKEN) and EMDOGEINE™(EM), synthetic HA (OsteoGen), freeze-dried demineralized bone (FDDDB), autogenous bone powder mixed with bovine bone granules. No materials were used in 16 cases. The duration to sacrifice after surgery was from 1 week to 6 months. Coronal sections of the frontal sinuses were observed by Olympus light microscope. All procedures were followed by the guideline for animal experiment at our institute.

Results : There were 19 cases in which thread-like structures of the lifted sinus membrane were observed in gross findings (Fig.1). Histopathologically the thread-like structure was composed of the ciliated cylindrical epithelium and the fibrous connective tissue including vascular canals (Fig.2). At the sites of contact between the sinus membrane and lifted membrane, adhesions were seen frequently. In a case, a bone fragment was seen at the center of the thread-like structure.



Fig.1 Coronal section of the dog frontal sinuses. Thread-like structures were seen.

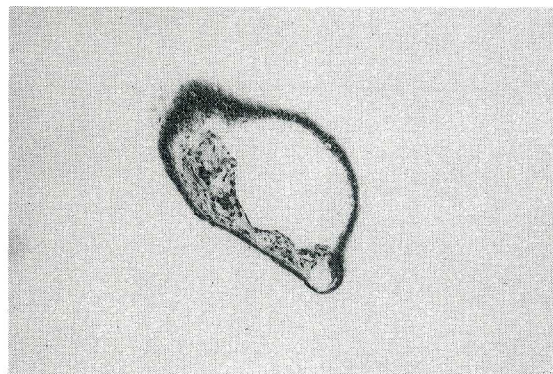


Fig.2 Histological findings of a thread-like structure. HE

Discussion : The incidence showing thread-like structures of the lifted sinus membrane in gross findings were 28.8% of 66 cases. Histopathologically, adhesion of the mucous membrane transforming of the fibrous connective tissue including blood canals and covering by epithelial tissue was seen at the contact sites between the lifted membrane and the original lining membrane. Thread-like configuration of the membrane was seen frequently in particular decrease of the space under the lifted membrane. These findings induce the thesis that first, the lifted sinus membrane attaches itself to the lining of the sinus membrane on the opposite side of the same sinus, consequently fine blood canals and fibrous tissues infuse each other through epithelial cells, the adhesive membrane remains, and then its form changes to a thread or sheet like structure after the space under the lifted membrane reducing. There is the possibility that thread like structure also exists in human sinuses where sinus lift surgery is performed. Consequently, the possibility that these structures disturb the function of the sinus membrane should be investigated.

Conclusion : Thread-like or sheet-like structures of the sinus membrane after sinus lift surgery have been observed frequently in a series of our animal experiments using dog's frontal sinuses. Pathologically it was composed of the membrane with ciliated cylindrical epithelium and the fibrous connective tissue

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