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Selection of Abstracts

INTRALIFT – the replacement of classic sinus-floor-elevation-methods by a new atraumatic ultrasonic hydrodynamic procedure

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_Abstract

On the basis of classic internal sinus-floor-elevation-methods ("Summers"-technique, BASS-technique) the TKW-Research-Group evaluated the pneumatic and hydraulic pressure needed to atraumatically separate the sinus-membrane from the bony sinus cavity. In an experimental series on 100 half sheep-heads the mean pneumatic pressure was 30 mbar +/- 6 mbar, the hydraulic pressure 20 mbar +/- 6 mbar. Applying the pressure in pulses improved the speed of detachment. Contrary to a mechanical detachment of the sinus-membrane with surgical instruments ("open" sinuslift with lateral approach, "Summers"-technique, BASS-technique) no tearing forces work on the membrane when using mere pneumatic and hydraulic pressure according to the basic physics-law of equal distribution of pressure in gasses and liquids. While pneumatic pressure results in a higher pressure-gradient necessary for detachment of the membrane because of compressibility of gasses and gaseous permeability of tissues, hydraulic pressure behaves superior with lower necessary pressure gradients and easier application according to the experimental series. Thus the TKW-Research-Group decided to develop the new atraumatic procedure on the basis of hydraulic pressure. To prove the superior safety of hydraulic detachment of the sinus-membrane a second experimental series on half sheep-heads was set up. After experimental puncture of the sinus membrane as it could occur with pilot-drills or surgical instruments the elevation procedure was continued using typical surgical-instruments ("Summers"-instruments, BASS-instru-

ments) and hydraulic pressure. While a ripping of the membrane with lengths between 5–12mm occurred with conventional surgical instruments ("Summers", BASS) in 80% of the cases because of the tearing forces applied to the membrane no single ripping occurred using hydraulic pressure. In case of iatrogene puncture of the membrane the puncture represents a "locus minoris resistentiae" working as the starting point of large ruptures when tearing forces are applied to the membrane in the mechanical detachment process while the same puncture works as a simple ventile when correct membrane-specific hydraulic pressure is applied missing any tearing forces on the membrane. According to the results of the experimental series computer-aided simulations were performed in cooperation with the Technical University Vienna. These simulations revealed a further improvement and safety of the procedure when hydrodynamic pressure is applied to the sinus-floor-membrane in pulses exceeding the mean relaxation-time of the various tissues forming the sinus-floor-membrane (respiratory epithelium, connective tissue, vessels, periost-like membrane). The necessary frequency was determined > 20 Mhz and < 50 Mhz achieving a microcavitation effect in watery liquids that further enhances the effectivity and atraumaticity of the detachment of the sinus-membrane from the bone. After successful experiments on half sheep-heads with various available oral-surgical ultrasonic devices and demonstration of the superiority of an ultrasonic hydrodynamic method for sinus-membrane detachment SATELEC-ACTEON agreed in manufacturing series of prototypes for the Piezotome according to the design developed by the TKW-Research-Group. The now "INTRALIFT-Tips" called prototypes were evaluated in various experimental series on half sheep-heads inviting general dentists to perform the INTRALIFT-procedure on sheep-heads without prior training to improve the design to an almost "fail safe" tool in the hand of the oral surgeon. In a worldwide series of Hands-on Workshops 143 dentists performed their very first INTRALIFT-procedure without a single perforation of the sheeps sinus-membrane. In an international multicenter study 132 patients were treated with the INTRALIFT-method with a complication rate of less than 1% (actually one patient due to a fracture of the TKW1-INTRALIFT-tip-