Modelling, Simulations and Prototyping of Oral Physiotherapy Device for OSF and TMJ Rehabilitation

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In Oral Submucous Fibrosis (OSF), fibrous bands and burning mucosal pain are restricted to oral opening and that resulted limited speech and eating ability. OSF is a common disease that has been identified among most South Asians and Africans, and a disease which has a trend of spreading in the Europe. Oral physiotherapy and surgical treatments are mainly used to treat such patients depending on the severity of the disease. The other important disease that can be treated through oral physiotherapy is the Temporomandibular joint (TMJ) disorder that also hassimilar difficulties and where oral physiotherapy treatments have become dominant. One degree of freedom soft actuated device developed by this research is operated by using soft-actuation to eliminate problems of existing mouth exercising devices by taking the patient jaw opening biodynamics, comfortability, shape of the oral cavity into account. The lowering push and pressure required to apply through a hand bole manually, is determined by taking the estimation data of the jaw opening forces, safety factor, cyclic operation and elastomer properties of the medical grade soft rubber. FEA simulations conducted for bellow shape design shows that the device is capable enough to maintain jaw opening gap while maintaining highest pressure with no material failures. Lab experiment shows that the device is in proper working condition and can withstand such a pressure when operating continuous up-down motion. OSF and TMJ disorder patients will be benefitted by this.

Keyword: Oral-physiotherapy, Oral-submucous-fibrosis, Temporomandibular joint disorder, Soft-actuators