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Impact of low-thermal injury devices on the margin status of laryngeal cancer- An experimental *ex vivo* study and clinical cases report of subtotal supracricoid laryngectomy

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Introduction: Status of margins significantly affects disease-free survival. The first aim of this study is to examine the *ex vivo* model of the effect of thermal-injury on margins status comparing traditional instrument with several low-thermal-injury devices. Secondly, we evaluated the evolution of supracricoid partial laryngectomy (SCPL) in indications, surgical techniques and outcomes through last decades.

Methods: The prospective study was conducted on ten excised larynges from patients affected by advanced laryngeal cancer, to assess the thermal-effect due to surgical incisions made at standard distance by using: Scalpel, CO2 laser, harmonic scalpel and electrocautery. Upon histopathological examination, thermal damage, tissue lost/retraction and tissue alterations were compared for each instrument. Then, a retrospective analysis of 146 laryngeal cancer patients treated with SCPL was carried on, by defining two different device groups and complications rate, functional and oncological results were documented and compared. Histo-pathological analysis of surgical margins was evaluated and correlated with local incidence of recurrence.

Results: Low-thermal-injury devices increased SA mean value from 800.7 to 11447.85 μm (72%), and S mean value from 2.226 to 2.910 mm (68.4%) ($p<0.05$). Surgical procedure was shorter in the harmonic scalpel group ($p<0.001$), with shorter swallowing recovery ($p=0.003$); moreover they showed a higher incidence of post-operative arytenoids edema ($p=0.03$) associated with a lower rate of pneumonia ($p=0.038$). Despite a higher rate of close or positive-margins, no higher incidence of local-recurrence was reported ($p=0.02$) compared to cold instrument group of patients.

Conclusions: We documented changing in indications and surgical technique for SCPL due to the development of modern diagnostic techniques and the introduction of low-thermal injury device allowing a more challenging tumor excision as well as with a shorter swallowing recovery in our series. The choice of surgical device could influence the histo-pathological margins status, consequently affecting postoperative therapeutic strategies and risk of recurrence.

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