OBJECTIVE
Commonly reported advantages of endoscopic CO2 laser surgery (ELS) are good oncologic results with low incidence of complications. Although less common if compared with conservative surgery, complications following ELS can be serious. We describe our institutional experience and discuss possible complications of ELS for laryngeal cancer.

INTRODUCTION
There are three recommended modalities of treatment for early laryngeal cancer: radiotherapy, partial open surgery, and - more recently - ELS. Over the last two decades, many studies demonstrated that oncological results of ELS are comparable to those of classic laryngeal partial procedures. The main advantages of an endoscopic approach - as compared with the standard open technique - are the better visualization and sometimes the possibility to perform the tracheotomy. It strongly correlates with the extent of resection. Methods of voice assessment are of crucial importance to objectify voice problems after the procedure. Once diagnosed, voice treatment is necessary too. Early beginning of voice therapy is recommended in order to prevent ineffective hyperkinetic compensatory mechanisms. Granulomas. Granulomas are non-cancerous growths composed mostly of granulation tissue and they reflect a response of tissue to injury and irritation (Figure 1). It is important not to overlook the difference between granuloma and the cancer recurrence. If endoscopic finding is raising a suspicion, one should take biopsies and do biopsy and histological analysis is absolutely necessary.

METHODS AND MATERIALS
The operations were carried out with a CO2 laser coupled to the operating microscope. The focus diameter of the micromanipulator was 0.3 mm and the delivered laser energy was 12 to 20 watts in continuous mode. Bleeding was controlled by electrocautery and laser surgery or bleeding was controlled by electrocautery and clipping. All supraglottic tumors were treated by en bloc removal.

RESULTS
Postoperative hemorrhage was encountered in 13 (6.4%) patients. In 7 of these it was necessary to perform a revision in the operating room, while 1 patient with the supraglottic cancer died on the 9th postoperative day due to the massive late bleeding. Temporary aspiration occurred in 19 (28%) patients with the supraglottic cancer; 6 of them developed postoperative pneumonia. One patient suffered heavy aspiration and recurrent aspiration pneumonia, thus total laryngectomy was performed nine months after his primary ELS. In patients who were treated for glottic carcinoma close follow-up revealed granulomas in 10 patients and synechiae in 7. Seven patients had more than one complication.

COMPLICATIONS AND THEIR TREATMENT
Postoperative hemorrhage. Postoperative hemorrhage presents the most serious complication. Its frequency is between 3 to 14%. The fatal outcome occur in 0.3% of patients. With glottic tumors postoperative hemorrhage is infrequent, while in supraglottic tumors bleeding is more common. More serious cases demand for surgical revision and endoscopic coagulation. Difficult intubation is expected due to limited visualization and sometimes is necessary to perform the tracheotomy. The most efficient tool to stop the bleeding is haemostatic clip, but if it is not possible to apply the clip electrocoagulation can be used. Extremely rarely, it is necessary to ligate external carotid artery or perform supraselective embolization. Very serious is late bleeding because patients are usually already at home without the appropriate urgent medical care and the fatal outcome is more likely.

Aspiration. In supraglottic laryngeal carcinoma – especially supraglottic – resection of natural protective boundary such as epiglottis, aryepiglottic folds and false vocal cords can lead to aspiration in either infant or adult clinical form. The frequency of aspiration depends on the method of evaluation, so registered disturbances in swallowing area range between 8%-100%. Open approach laryngectomies more often result in aspiration as compared to endoscopic approach. We performed the evaluation of functional deglutition in patients after partial supraglottic laryngectomy by videofluoroscopy of the swallowing act. Aspiration was recorded on videofluoroscopy in 30% of our patients, compared to almost 90% of patients who underwent classic supraglottic laser resection.

Pneumonia. The incidence of both early postoperative and late pneumonia in most of studies ranges between 3-7%. Patient’s age, type, and extent of surgical resection, as well as preoperative pulmonary status were shown to be important prognostic factors in frequency of this complication. Common treatment is the antibiotic therapy, but sometimes – in cases of recurrent pneumonia – it is necessary to perform a temporary tracheotomy and place a feeding tube for a longer period of time. Very rarely – in cases resistant to all other treatments – patient will need a total laryngectomy as a definite solution for aspiration.

CONCLUSIONS
Although commonly emphasized as the low-risk surgery, ELS of laryngeal cancer can result with serious morbidities that needs attention. Publications discussing complications of this type of surgery are rare. We report our institutional experience. Complications were more prevalent after the treatment of supraglottic lesions. If compared with open surgery, CO2 laser surgery of laryngeal cancer has lower incidence of complications.

REFERENCES

Figure 1. Granuloma
Figure 2. Synchiae
Figure 3. Glottic gap

(Without Image)

Complications of Endoscopic CO2 Laser Surgery for Laryngeal Cancer
Drago Prgomet, Ratko Prstačić, Mario Bilić, Saša Janjanin
University Department of ENT, Head and Neck Surgery; Zagreb University Hospital Center; Kišpati 12, HR-10000 Zagreb, Croatia, Europe