Diagnostic significance of magnetic resonance imaging in preoperative evaluation of patients with laryngeal tumours

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Purpose

One of the frequent indications for magnetic resonance imaging (MRI) of the neck are laryngeal tumors. Although the clinical examination and endoscopy allows the tumor to be directly visualized, MRI is an important method in evaluation of infiltration of the adjacent structures.

MRI examination includes assessment of the localization of tumor in respect to laryngeal substies, supraglottis, glottis and subglottis, infiltration of paraglottic/paralaryngeal and preepiglottic spaces, cartilage invasion, metastases in regional lymph nodes and in the soft tissues of the neck. The combined information allows tumor to be classified according to the relevant TNM staging.

The purpose of this article is to demonstrate the clinical significance of MRI in preoperative evaluation of laryngeal tumors, important for further clinical and therapeutic decision making.

Methods and Materials

The study was based on the prospective analysis of MRI images in series of 34 patients (88% males), overall average age 62.2±5.1 years; range 49-70 years, who underwent MRI imaging prior to surgery. The study was done in the Center for Radiology and MRI and the Clinic for ENT and Maxillofacial Surgery, Clinical Center of Serbia in 2009 and 2010.

The patients were referred to the ENT clinic due to hoarseness, coughing, difficulty breathing and swallowing, and all were long-time smokers. Upon admittance to the hospital, all patients had pretherapeutic staging protocol including indirect laryngoscopy, endoscopic examination with biopsy, and MRI examination. All patients gave formal consent for all diagnostic and therapeutic procedures.

All MR imaging studies were obtained at Siemens Avanto 1.5 T and included turbo spin-echo images (TSE) sequence in T1w image in axial plane, T2w in axial, coronal and sagittal planes and T2w FS in axial plane before and T1w in axial and coronal planes after intravenous administration of gadolinium contrast.

Results
The study included 34 patients, (87% males), mean age 62.2±5.1 years, range 49-70 years. In 15 patients (44%) the tumor was glottic, in 10 patients (29%) supraglottic, in 9 (15%) patients tumor was transglottic. All patients had hoarseness, 17 (57%) were coughing, five (74%) experienced swallowing problems, and 20 patients (65%) complained of neck pain.

Based on MRI findings, tumor extension to subglottic subside was seen in 10 (29%) patients, while at the surgery in 13 (38%) patients, which was not statistically significant difference (z = -0.7; p>0.05). Growth tumor to the anterior commisure was assessed in 16 (48%) patients on MRI and in 16 (48%) patients at the surgery, which also did not reach statistical significance (z = 0.1; p>0.05). Infiltration of the paraglottic spaces was seen in 24 (71%) patients on MRI and in 16 (47%) patients at the surgery, which was statistically significant difference (z = -0.4; p<0.05), (Figure 1, 2). Preepiglottic space was invaded by tumor in 11 (33%) patients on MRI and in 10 (29%) patients at the surgery, which has not been shown to be of statistically significant difference (z = -0.4; p>0.05). Eight patients had infiltration of preepiglottic and paraglottic space at the same time. Cartilage infiltration was seen on MRI in 7 (19%) patients which was confirmed in 5 patients at the surgery (14%), (z = -1.3; p>0.05), (Figure 3). All patients had lymphadenopathy in region II-IV, and 2 patients had lymph nodes larger than 20 mm with presence of central necrosis, also confirmed on pathohistology. Thirteen patients had metastatic lymph nodes which appeared normal on MRI (Figure 4).

In all patients squamocellular carcinoma was confirmed on biopsy and classified according to the International Union against Cancer, (6th ed. 2002). Using TNM classification, twelve patients were identified as T2 (36%), 18 as T3 (53%) and 4 as T4 (11%). According to MR findings, to 4 patients T2 stage was assigned, to 26 patients T3 and to 4 patients T4 stage. Eight (24%) T2 tumors were overstaged as T3, while correct staging was seen in 76% patients, (#=0.59; p<0.05).

Images for this section:
Fig. 1: Coronal plane of T2w MRI. Tumor of the glottic region, with infiltration of the right preepiglottic space (white arrow).
**Fig. 2:** Infiltration of the paraglottic space. On axial T2w MRI white arrow indicates tumor infiltration of the paraglottic space to the right (A). After administration of the contrast media (B), white arrow shows hyperenhancement of the tumor tissue in T1w FS image, while arrowhead is pointing to tumor propagation of the left paraglottic space.
**Fig. 3:** Axial T2w FS image shows the tumor infiltration of prelaryngeal soft tissues (white arrow). Air space is reduced to small, few millimeters in diameter triangular space (black arrow).
Fig. 4: Axial T2w (A) and T2wFS image (B). Enlargement of jugulary lymph nodes with presence of central necrosis due to laryngeal squamocellular carcinoma (white arrows).
Conclusion

The study has shown that MRI is of high diagnostic value in assessment of submucosal structures of the larynx with exception of paraglottic space most probably due to the presence of peritumoral inflammation. Therefore, MRI could be considered as a significant and reliable diagnostic method in preoperative staging of laryngeal tumor and further clinical decision making in these patients.

References


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