Computed Tomography versus Magnetic Resonance Image in Detection of Thyroid Cartilage Invasion in Laryngeal Carcinoma.

Meta analysis Study
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(وما أوتيتم من العلم إلا قليلا)

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AJCC American Joint Committee on Cancer.

ASCO American Society of Clinical Oncology.

AUC Area under the SROC curve.

C Cervical vertibry.

CI Confidence interval.

CT Computed tomography.

DOR Diagnostic odds ratio.

FEM Mantel-Haenszel fixed-effects method.

Fig Figure.

FN False negative.

FOV Field-of-view.

FP False positive.

I^2 I-square.

IV Intravenous.

LR+ Likelihood ratio of a positive test.

LR- Likelihood ratio of a negative test.

MRI Magnetic resonance imaging.

NPV Negative predictive value.

PPV Positive predictive value.

REM DerSimonian-Laird random-effects method.

SCC Squamous cell carcinoma.

Sen Sensitivity.

SROC Summary receiver-operating characteristic.

Spe Specificity.

TNM Primary tumor (T),regional nodes (N),and metastasis (M).

TN True negative.

TP True positive.

5-FU Fluorouracil.

$\boldsymbol{\tau^2}$ Tau-squared.

Chapter 1

Introduction

Laryngeal cartilage invasion is of great importance in the staging of laryngeal carcinoma according to TNM classification. Tumor invasion through the inner cortex of the thyroid is considered a T3 tumor, whereas tumor invasion through the outer cortex of the thyroid or cricoid is a T4 tumor **(Gómez,et al. 2015).**

The extent of cartilage invasion influences the choice of treatment. According to the Dutch national guideline on laryngeal carcinoma, a small T3 tumor should be treated with (accelerated) radiotherapy, or in selected cases, with larynx-preserving surgery **(Nederlandse,et al. 2013).**

Large T3 and T4 tumors can be treated with chemo radiotherapy. However, pretherapeutic organ function may already be gravely impaired in these cases, making surgery (with postoperative radiation) the therapy of choice in their center **(Nederlandse,et al. 2013).**

According to the American Society of Clinical Oncology (ASCO), in most patients with T3 or T4 disease without cartilage invasion through the outer cortex of the cartilage, a larynx preservation approach is an appropriate treatment option, and chemoradiation is the most widely applied approach. Patients with

tumor penetration through cartilage into soft tissues are considered poor candidates for larynx preservation. Primary surgery, usually a total laryngectomy, is commonly recommended **(Nederlandse,et al. 2013).**

Cartilage invasion has often been suggested as a contraindication to partial laryngectomy, but this was largely based on studies prior to the introduction of computer-assisted cross-sectional imaging **(Curtin.1989).** With the advent of axial imaging techniques clarification of the submucosal extent of disease became possible **(Castelijns,et al. 1996).**

Cartilage invasion determines the choice of therapy to a great extent and therefore requires an adequate diagnostic test. Previous studies are inconclusive regarding the consequences of cartilage invasion visible on computed tomography (CT) or magnetic resonance imaging (MRI). Some studies report that major cartilage invasion has a negative impact on the likelihood of tumor recurrence and prognosis after radiation **(Freeman,et al.1990,Castelijns,et al.1995,Pameijer,et al.1997).** Others state that irradiation of T4 tumors may carry an increased risk of complications such as edema and necrosis **(Freeman,et al. 1990).**

A common drawback in studies investigating diagnostic modalities for laryngeal cartilage invasion is the risk of selection bias caused by the fact that histology is used as a reference test,

because this implies that only those patients with an indication for surgery are included. As it seems likely that the prevalence of cartilage invasion in these study populations is higher than it is in the general population of patients with laryngeal cancer, this bias would probably lead to overestimation of the positive predictive value (PPV) and underestimation of the negative predictive value (NPV) of the diagnostic modality under investigation **(Castelijns,et al.1988,Becker,et al. 1995).**

Compared to CT, MRI has a similar ability to define the interface between fat and tumor, but is superior for assessing muscle and cartilage invasion. Additionally,MRI does not require iodinated contrast, does not involve ionizing radiation, has no dental amalgam artifacts, and has superior soft tissue contrast as well as possibilities for multiparametric imaging(e.g., T1weighted, T2 weighted). However, CT evaluation is much faster than MRI, substantially reducing or eliminating artifacts induced by movements attributable to breathing, swallowing, or coughing **(Castelijns,et al.1988,Becker,et al. 1995).**

The Dutch national guideline on laryngeal carcinoma states that CT has low sensitivity and high specificity for assessing cartilage invasion, whereas MRI has high sensitivity and lower specificity .The guideline indicates that either CT or MRI should be used for the assessment of cartilage invasion, but the choice