The cost-effectiveness of radiofrequency ablation for Barrett's esophagus with low-grade dysplasia: results from a randomized controlled trial (SURF trial) CME

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Background and Aims: The Surveillance versus Radiofrequency Ablation (SURF) trial randomized 136 patients with Barrett's esophagus (BE) containing low-grade dysplasia (LGD), to receive radiofrequency ablation (ablation, n = 68) or endoscopic surveillance (control, n = 68). Ablation reduced the risk of neoplastic progression to high-grade dysplasia and esophageal adenocarcinoma (EAC) by 25% over 3 years (1.5% for ablation vs 26.5% for control). We performed a cost-effectiveness analysis from a provider perspective alongside this trial.

Methods: Patients were followed for 3 years to quantify their use of health care services, including therapeutic and surveillance endoscopies, treatment of adverse events, and medication. Costs for treatment of progression were analyzed separately. Incremental cost-effectiveness ratios (ICER) were calculated by dividing the difference in costs (excluding and including the downstream costs for treatment of progression) by the difference in prevented events of progression. Bootstrap analysis (1000 samples) was used to construct 95% confidence intervals (CIs).

Results: Patients who underwent ablation generated mean costs of U.S.$13,503 during the trial versus $2236 for controls (difference $11,267; 95% CI, $9996-$12,378), with an ICER per prevented event of progression of $45,066. Including the costs for treatment of progression, ablation patients generated mean costs of $13,523 versus $4,930 for controls (difference $8593; 95% CI, $6881-$10,153) with an ICER of $34,373. Based on the various ICER estimates derived from the bootstrap analysis, one can be reasonably certain (>75%) that ablation is efficient at a willingness to pay of $51,664 per prevented event of progression or $40,915 including downstream costs of progression.

Conclusions: Ablation for patients with confirmed BE-LGD is more effective and more expensive than endoscopic surveillance in reducing the risk of progression to high-grade dysplasia/EAC. The increase in costs of ablation can be justified to avoid a serious event such as neoplastic progression. At a willingness to pay of $40,915 per prevented event of progression, one can be reasonably certain that ablation is efficient. (www.trialregister.nl number: NTR 1198.) (Gastrointest Endosc 2017;86:120-9.)

Abbreviations: BE, Barrett's esophagus; CI, confidence interval; EAC, esophageal adenocarcinoma; ICER, incremental cost-effectiveness ratio; LGD, low-grade dysplasia; SURF trial, Surveillance versus Radiofrequency Ablation trial; QALY, quality-adjusted life-year.

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INTRODUCTION

The incidence of esophageal adenocarcinoma (EAC) continues to increase significantly in the western world.[1,2] Malignant degeneration in Barrett's esophagus (BE), the most important precursor for development of EAC, is thought to occur in a step-wise fashion: from non-dysplastic intestinal metaplasia to low-grade dysplasia (LGD), then high-grade dysplasia, and eventually adenocarcinoma.[3,4] Depending on the presence and severity of dysplasia, patients with BE either undergo endoscopic surveillance or treatment.[4]

Radiofrequency ablation is an established endoscopic technique for eradication of BE with and without dysplasia, and is associated with an acceptable safety profile and, more importantly, a reduced risk of neoplastic progression.[5-8] Ablation, if necessary combined with endoscopic resection of visible abnormalities, is considered the management strategy of choice for patients with BE with high-grade dysplasia and early cancer.[9,10] The optimal management strategy for patients with LGD is less well established.

A recent study indicated that endoscopic surveillance of patients with BE is neither cost-effective nor preventative.[11] Ablation of LGD may therefore be clinically useful if neoplastic progression can be reduced at an acceptable cost profile. Using a BE disease model, we previously analyzed the cost-effectiveness of ablation treatment for patients with BE with and without dysplasia.[12,13] This analysis suggested that ablation might be cost-effective for LGD if the disease is confirmed and stable.[13] However, as with any modeling study, the validity of these results is limited by the uncertainty of the model inputs: data on the natural history of LGD were scarce; and all simulations were based on a hypothetical cohort of 50-year-old otherwise healthy individuals. For medical decision making with regard to LGD in BE, more robust cost-effectiveness data are necessary.

In the recently published SURF (Surveillance versus Radiofrequency Ablation) trial, standard endoscopic surveillance was compared with radiofrequency ablation in the prevention of neoplastic progression in patients with BE with a confirmed diagnosis of LGD. The SURF trial was closed before all patients reached the projected 3 years of follow-up because of the superiority of ablation for the primary endpoint.[14] In the trial, ablation resulted in eradication of BE and dysplasia in about 90% of patients and only a limited number of adverse events were observed. The present study was performed alongside the SURF trial and is the first trial-based cost-effectiveness analysis of ablation compared with endoscopic surveillance for the management of patients with BE with LGD. This analysis was performed from the perspective of a Dutch hospital provider taking into account the associated costs and events of neoplastic progression during the 3 years of the trial.

METHODS

Patient population and the SURF study protocol

The methods and results of the SURF trial have been described in detail elsewhere (www.trialregister.nl, NTR 1198).[14] In brief, 136 patients (116 male, mean age 63 years) were recruited between June 2007 and June 2011 from 9 centers in the Netherlands, Belgium, United Kingdom, and Ireland. Patients with confirmed LGD in BE were randomized to receive radiofrequency ablation (ablation) or endoscopic surveillance (control). In all patients, the LGD diagnosis was confirmed once by one of the pathologists from a central panel of expert pathologists before inclusion. In the ablation group, patients were treated with the circumferential or focal radiofrequency ablation catheter until complete endoscopic and histologic eradication of BE was achieved. If BE epithelium persisted after the maximum number of ablations was reached (maximum 2 circumferential and 3 focal sessions), a single session of endoscopic resection or argon plasma coagulation was permitted.[14] The first follow-up endoscopy with biopsy was scheduled 3 months after the last therapeutic endoscopy, with subsequent follow-up performed annually. In the control group, patients underwent surveillance endoscopy with biopsy at 6 and 12 months within the first year, with subsequent follow-up performed annually. The primary outcome of interest was the occurrence of high-grade dysplasia or EAC (defined as neoplastic progression) at any time during the 3 years after randomization. Patients who showed neoplastic progression were treated per standards for high-grade dysplasia/EAC.

Clinical outcomes of the SURF trial

Sixty-eight patients were randomized to ablation and 68 patients to the control group. Within 3 years, 1.5% (n = 1) of the patients in the ablation group had neoplastic progression compared with 26.5% (n = 18) of patients in the control group. Ablation significantly reduced the risk of neoplastic progression by 25.0% (95% confidence interval [CI], 14.1-35.9).

Design of the economic study

This prospective cost-effectiveness analysis was developed from a Dutch hospital provider perspective, and compared radiofrequency ablation against endoscopic surveillance alongside the SURF trial. All authors had access to the study data and reviewed and approved the final manuscript.

Volumes of used resources

Major use of health care resources from the randomization date until the end of follow-up (restricted to 36 months) was gathered principally from the study database.