HIGH-RESOLUTION IMAGING OF THE LARYNGEAL CARTILAGES: VOLUNTEER AND CANCER PATIENT STUDIES
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INTRODUCTION
Laryngeal cancer is the most common non-cutaneous cancer in the head and neck. The initial treatment is typically radiation therapy. If the tumor persists or recurs, then a total laryngectomy is often required [1]. Laryngeal cartilage invasion is considered by most clinicians to be a contraindication to primary radiation therapy because it implies a greater likelihood of radiation treatment failure. However, cartilage invasion can be difficult to assess using current imaging modalities (CT and conventional MRI) unless the invasion is extensive. In this work, we demonstrate the benefits of high-resolution MR to image the laryngeal cartilages.

METHODS
Our dedicated 3-channel array [2] is shaped on a half-cylinder that fits most neck geometries (Fig. 1a). Each element is a 5 cm x 5 cm square coil. The optimal sensitivity is 2 cm below the skin surface, which is the mean maximal depth of thyroid cartilage in the healthy adult [3]. We improved the array in two ways. First, to enhance preamplifier decoupling, a π network was tuned for each channel at the junction with the scanner [4]. Second, we implemented an intensity correction method to compensate for the coil sensitivity profile that makes subcutaneous fat undesirably bright. The intensity correction method fits a low-order polynomial to the image [5]. Polynomial coefficients are computed by solving a convex optimization problem using cvx (cf. poster # 2410) [6].

RESULTS

CLINICAL CASE 1 The patient is a 55-year-old male with an advanced carcinoma of the right hemilarynx, previously treated with radiation therapy.

We performed the high-resolution scans 45 days after the clinically indicated conventional scans that followed therapy. The FOV was 20/10 cm and the slice thickness 5/2 mm for the conventional/high-resolution scans.

Despite motion artifacts—always pronounced post-treatment due to patient discomfort and visible in both scans—the improvement in resolution is striking (Fig. 3). In the high-resolution images, the cartilages are well-delineated, and, as a sidenote, the radiation effects on skin become visible.

CONCLUSION
We have demonstrated that the resolution and quality of laryngeal MR images of cancer patients can be dramatically improved by the use of a dedicated array.

REFERENCES