

Review Article

# Vocal cord palsy after anterior cervical spine surgery: a qualitative systematic review

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## Abstract

**BACKGROUND CONTEXT:** Vocal cord palsy (VCP) is a known complication of anterior cervical spine surgery. However, the true incidence and interventions to minimize this complication are not well studied.

**PURPOSE:** To conduct a systematic review to identify the incidence, risk, and interventions for VCP after anterior cervical spine surgery.

**STUDY DESIGN:** This is a qualitative systematic literature review.

**SAMPLE:** Prospective and retrospective trials of patients undergoing anterior cervical spine surgery that reported on postoperative VCP or recurrent laryngeal nerve palsy.

**OUTCOME MEASURES:** Primary: incidence of VCP after anterior cervical spine surgery; secondary: risk factors and interventions for prevention of VCP after anterior cervical spine surgery.

**METHODS:** Electronic searches were conducted on Ovid Medline, EMBASE, Cochrane Central Register of Controlled Trials, and Cochrane Database of Systemic Reviews for clinical studies reporting VCP in anterior cervical spine surgery, limited to studies published between 1995 and June 2013 in English and French languages. After selection of studies independently by two review authors, data on incidence, risk, and interventions were extracted. Qualitative analysis was performed on three domains: quality of studies, strength of evidence, and impact of interventions.

**RESULTS:** Our search has identified 187 abstracts, and 34 studies met our inclusion criteria. The incidence of VCP ranges from 2.3% to 24.2%. Significant heterogeneity in study design and definition of VCP were used in the published studies. There is good evidence that reoperation increases the risk of VCP. One study of moderate strength suggests that operating from the right side may increase the risk of VCP. Among the interventions studied, endotracheal tube (ETT) cuff pressure monitoring with deflation during retraction has shown to reduce the incidence from 6% to 2%, but this result was not confirmed by randomized control trials. Limited evidence exists for other interventions of intraoperative electromyographic monitoring and methylprednisolone.

**CONCLUSIONS:** Vocal cord palsy is a significant morbidity after anterior cervical surgery with incidence up to 24.2% in the immediate postoperative period, with a higher risk in reoperation of the anterior cervical spine. Moderate evidence exists for ETT cuff pressure adjustment in preventing this complication. © 2014 Elsevier Inc. All rights reserved.

## Keywords:

Vocal cord palsy; Anterior cervical spine surgery; Endotracheal tube; Electromyography; Laryngeal nerve; Dysphonia

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## Introduction

Smith and Robinson [1] introduced the anterior approach to the cervical spine for the management of symptomatic degenerative cervical disease. This approach had steadily grown in popularity that in the decade from 1990 to 1999, more than 500,000 anterior cervical discectomy and fusion (ACDF) was performed in the United States alone [2].

Vocal cord palsy (VCP) as a consequence of the anterior cervical spine surgery had long been recognized. Vocal cord palsy encompasses a spectrum of vocal cord dysfunction (VCD) from partial dysfunction (vocal cord paresis) to complete immobility (vocal cord paralysis) [3].

Cloward [4] reported 8% to 10% incidence of temporary hoarseness and 2% risk of vocal cord paralysis. Heeneman [5] retrospectively reviewed 85 patients and found 11% risk of dysphonia and 7% risk of VCP. Bulger et al. [6] followed 102 patients with indirect laryngoscopies and detected a 1% risk of recurrent laryngeal nerve palsy (RLNP).

Since the publication of these articles, newer studies had shown varying incidence of VCP ranging from as low as 0.2% up to 24% [7,8]. Spanu et al. [9] found that VCP is the most common complication in anterior cervical spine surgery, whereas Fountas et al. [10] suggest that it is the third largest complication after ACDF [9,10].

Given such varying incidence of this common and important complication after anterior cervical spine surgery, a clearer understanding of this complication by systematically reviewing the literature is needed.

This review will attempt to answer the following clinical questions:

1. What is the incidence of postoperative VCP after anterior cervical spine surgery?
2. What are the risk factors associated with postoperative VCP with these surgeries?
3. What interventions could reduce the incidence of postoperative VCP in anterior cervical spine surgeries?

## Methods

The guidelines of Preferred Reporting Items for Systematic Reviews and Meta-Analyses were followed for conducting systematic reviews [11].

### Data source

Electronic searches were conducted on Ovid Medline, EMBASE, Cochrane Central Register of Controlled Trials, and Cochrane Database of Systemic Reviews using the following free-text and associated medical subject heading terms: ACDF, anterior cervical surgery, or anterior spine surgery. This was combined with the Boolean AND with the terms of vocal cord palsy or vocal cord paralysis or vocal cord paresis or recurrent laryngeal nerve.

Studies were limited to articles published in English and French languages from 1995 to June 2013, as studies before 1995 had been previously described [12].

Study eligibility was independently determined by reading the title and abstracts by the authors (TPT and APG). After abstract screening, studies meeting eligibility criteria were subjected to a full-text review. Articles were also retrieved for abstracts that did not provide enough information for inclusion/exclusion at the first stage of screening. References within all identified studies were checked for eligibility for inclusion. Studies failing to meet eligibility criteria after full-text review were excluded.

### Inclusion and exclusion criteria

We included prospective or retrospective studies, with at least 10 patients, which reported on postoperative VCP or RLNP, as defined as abnormal vocal cord movements examined with direct or indirect laryngoscopy, or documented VCP or dysphonia in surgical notes, in patients who had undergone any types of anterior cervical spine surgery. Case series of less than 10 patients, case reports, cadaveric studies, and studies with unclear reporting of methods or results were excluded.

### Analysis

We analyzed the characteristic and quality of every article by extracting the following information: year of publication, number of patients in the study, definition and incidence of VCP, interventions, surgical factors (side of approach, level, multilevel, duration, outpatient), type of study (prospective vs. retrospective), and any other pertinent results as reported by the authors. Data were summarized and presented in tables.

Quantitative analysis was not possible because of the significant heterogeneity in study design and definitions of VCP of the extracted articles. Hence, qualitative analysis was performed on three domains: quality of studies (Oxford Center for Evidence-Based Medicine Levels of Evidence) [13], strength of evidence, and impact of interventions (Table 1).

## Results

Initial database search revealed 177 citations, and with further review of the reference lists, 10 additional studies were identified. One hundred and forty-eight records were excluded after review of title and abstracts, and 39 studies were included for full review. Five studies were excluded: one grouped the incidence of VCP of anterior and posterior cervical spine surgery [14], two had unclear methodology [15,16], one listed the incidence of VCP in the discussion section but not in the results section [17], and one was published in Mandarin [18].

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