

**COMPARISON OF VOCAL FOLD AUGMENTATION OUTCOMES USING AUTOLOGOUS FAT VERSUS CALCIUM HYDROXYAPATITE INJECTION IN UNILATERAL VOCAL FOLD PARALYSIS****Sarthak Sidana**

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ABSTRACT

Background: Unilateral vocal fold paralysis (UVFP) leads to dysphonia, impaired communication, and reduced quality of life. Injection laryngoplasty is a minimally invasive option for medialization, with autologous fat (AF) and calcium hydroxyapatite (CaHA) being commonly used injectables. **Objective:** To compare voice outcomes, complications, and long-term efficacy of AF versus CaHA injection laryngoplasty. **Methods:** A prospective hospital-based study was conducted on 50 patients with UVFP. Participants were randomized into two groups: Group A (n=25, AF injection) and Group B (n=25, CaHA injection). Pre- and postoperative assessments included fibroscopy, glottic closure, mucosal wave, false vocal folds, and Voice Handicap Index-10 (VHI-10). Patients were followed at 3 months and 9–12 months. **Results:** Both groups showed significant improvement in glottic closure (88% AF vs 92% CaHA), false vocal fold compensation (88% vs 92%), and VHI-10 scores (>80% improvement) at one year. Mucosal wave recovery was faster with AF (88% at 3 months), whereas CaHA showed gradual but comparable improvement by one year (88%). Complications were minimal: AF group showed slightly higher migration (3 cases) while CaHA had one granuloma. No major adverse events were reported. **Conclusion:** Both AF and CaHA are safe and effective for vocal fold augmentation, with comparable long-term outcomes. AF demonstrates earlier mucosal wave recovery, while CaHA offers durable medialization. Choice of material should be individualized, with medialization thyroplasty reserved for non-responders.

KEYWORDS : Vocal Fold Paralysis, Injection Laryngoplasty, Autologous Fat, Calcium Hydroxyapatite, Voice Outcome.**INTRODUCTION**

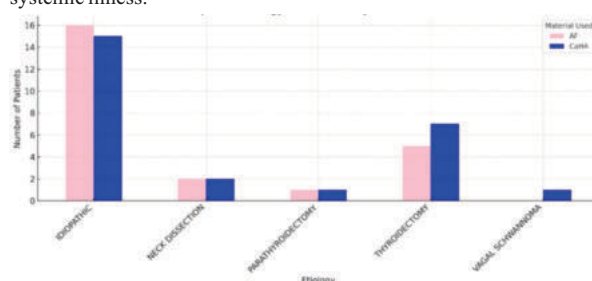
Unilateral vocal fold paralysis (UVFP) is a relatively common disorder characterized by impaired vocal fold mobility due to injury of the recurrent laryngeal nerve or intrinsic laryngeal muscles. Patients often present with hoarseness, breathy voice, reduced vocal intensity, aspiration, and reduced quality of life. Iatrogenic injury (particularly after thyroid and parathyroid surgery) is the most frequent cause, though idiopathic and neoplastic etiologies are also encountered.

Management options for UVFP include conservative therapy (speech therapy), injection laryngoplasty, laryngeal framework surgery, and reinnervation procedures. Among these, injection laryngoplasty has emerged as a first-line treatment due to its minimally invasive nature, immediate results, and relatively low complication rate.

Various injectable materials have been used historically, including Teflon, bovine collagen, hyaluronic acid, autologous fat, and calcium hydroxyapatite (CaHA). Teflon, once widely used, fell out of favor due to granuloma formation and migration. Currently, AF and CaHA are the most common injectables, each with unique properties. AF is autologous, biocompatible, and inexpensive, though variable resorption is a limitation. CaHA provides a more durable, semi-permanent augmentation with fibroblast-mediated collagen stimulation but may cause stiffness if injected superficially. This study aims to evaluate and compare the efficacy, durability, and complications of AF and CaHA in the management of UVFP.

METHODS

This is a prospective, hospital-based cross-sectional study conducted in the Department of Otorhinolaryngology, Government Medical College, Kota, between June 2023 and June 2025, after institutional. Fifty patients aged 18–75 years with clinically and radiologically diagnosed UVFP were enrolled. Etiologies included idiopathic, post-thyroidectomy, post-neck dissection, and post-parathyroidectomy cases. Adults with hoarseness due to idiopathic or iatrogenic UVFP are included in the study with exclusion criteria comprising of cases with Bilateral palsy, malignant causes, psychiatric comorbidities, severe systemic illness.



Patients are randomized into two groups. Group A (n=25) consisted of those in which Autologous fat is used as material for injection laryngoplasty and Group B (n=25) of those patient's in which CaHA is injected.

Autologous Fat Harvesting & Preparation: Fat was aspirated from periumbilical tissue, processed via centrifugation, and injected into the paraglottic space under local or general anesthesia. Commercially prepared CaHA (Radiesse®) is injected into the paraglottic space under endoscopic guidance. Both percutaneous (office-based) and microlaryngoscopic (under general anesthesia) approaches are used.

Assessments

Patients evaluated preoperatively and at T1 (3 months) and T2 (9–12 months).

Objective measures used are Fibroscopy—glottic closure, mucosal wave, false vocal fold activity. Subjective measures like Voice Handicap Index-10 (VHI-10) is also taken into consideration.

Statistical Analysis: Wilcoxon signed-rank test used for paired analysis; $p < 0.05$ was considered significant.

RESULTS

A total of 50 patients are included in the study, comprising 18 males and 32 females, with a mean age of 46 years. Group A (autologous fat, AF) included 25 patients (8 males and 17 females) with a mean age of 47 years, while Group B (calcium hydroxyapatite, CaHA) also consisted of 25 patients (10 males and 15 females) with a mean age of 45 years. The etiologies of unilateral vocal fold paralysis are idiopathic in 60% of cases, post-thyroidectomy in 26%, post-neck dissection in 8%, post-parathyroidectomy in 4%, and due to vagal schwannoma in 2%.

In terms of voice outcomes, glottic closure improvement at one year observed in 88% of patients in the AF group and 92% in the CaHA group. Both groups demonstrated significant postoperative improvement in Voice Handicap Index (VHI-10) scores. In the AF group, the mean preoperative score improved from 22.36 to 9.68 at one year, while in the CaHA group, it improved from 19.00 to 8.44. Mucosal wave recovery was faster in the AF group, with 88% showing improvement at three months compared to 60% in the CaHA group; however, by one year, recovery rates were comparable between groups (84% in AF vs 88% in CaHA). Additionally, more than 80% of patients in both groups showed normalization of false vocal fold activity at one year.

Table: Showing Overall Changes in the Parameters with Both the Materials at Both Followups.

Parameter	Group A (Autologous Fat)	Group B (CaHA)	P Value / Interpretation
Glottic Closure Improvement (3 months)	88%	72%	p = 1.0 (NS)
Glottic Closure Improvement (1 year)	88%	92%	p = 1.0 (NS)
False Vocal Fold Improvement (3 months)	76%	88%	p = 0.05 (NS)
False Vocal Fold Improvement (1 year)	88%	92%	p = 0.05 (NS)
VFQ-12 Improvement (3 months)	84%	88%	p = 0.05 (NS)
VFQ-12 Sustained Benefit (1 year)	88%	84%	p = 0.05 (NS)
Mucosal Wave Improvement (3 months)	88%	92%	p = 0.043 (Significant)
Mucosal Wave Improvement (1 year)	84%	88%	p = 0.867 (NS)
Overall Improvement (Glottic/VFQ/Mucosal)	88% (Glottic) / 88% (VFQ) / 88% (Mucosal)	92% (Glottic) / 92% (VFQ) / 88% (Mucosal)	p = 0.05 (NS)

CONCLUSION

This comparative study evaluating the outcomes of autologous fat (AF) and calcium hydroxylapatite (CaHA) injections for vocal fold medialization demonstrates that both materials are effective and safe for improving glottic insufficiency. Across multiple functional parameters—including mucosal wave preservation, false vocal fold status, and glottic gap closure—both groups showed comparable rates of improvement, with no statistically significant differences. Objective assessments at multiple timepoints (T0, T1, T2) confirmed sustained voice quality improvement in the majority of patients, with overall glottic improvement observed in over 85% of cases in both groups. Complication rates were low and largely minor, with a few cases of implant migration and granuloma formation. Notably, neither group experienced severe inflammation or major adverse events. The transient nature of some outcomes—such as AF's tendency for partial resorption and CaHA's limited duration—highlights the importance of patient selection and follow-up when choosing an injectable material.

While injection laryngoplasty remains a valuable first-line treatment for unilateral vocal fold paralysis or glottic insufficiency, a subset of patients may experience suboptimal or temporary improvement. In such cases, medialization thyroplasty serves as a definitive and durable surgical alternative, particularly for those with persistent voice dysfunction, poor closure, or recurrent glottic gap following failed injection.

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