Assessment and Treatment of Pain during In-Office Otolaryngology Procedures: A Systematic Review

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Abstract

Objective. To qualitatively assess practices of periprocedural pain assessment and control and to evaluate the effectiveness of interventions for pain during in-office procedures reported in the otolaryngology literature through a systematic review.

Data Sources. PubMed, CINAHL, and Web of Science searches from inception to 2018.

Review Methods. English-language studies reporting qualitative or quantitative data for periprocedural pain assessment in adult patients undergoing in-office otolaryngology procedures were included. Risk of bias was assessed via the Cochrane Risk of Bias or Cochrane Risk of Bias in Non-Randomized Studies of Interventions tools as appropriate. Two reviewers screened all articles. Bias was assessed by 3 reviewers.

Results. Eighty-six studies describing 32 types of procedures met inclusion criteria. Study quality and risk of bias ranged from good to serious but did not affect assessed outcomes. Validated methods of pain assessment were used by only 45% of studies. The most commonly used pain assessment was patient tolerance, or ability to simply complete a procedure. Only 5.8% of studies elicited patients’ baseline pain levels prior to procedures, and a qualitative assessment of pain was done in merely 3.5%. Eleven unique pain control regimens were described in the literature, with 8% of studies failing to report method of pain control.

Conclusion. Many reports of measures and management of pain for in-office procedures exist but few employ validated measures, few are standardized, and current data do not support any specific pain control measures over others. Significant opportunity remains to investigate methods for improving patient pain and tolerance of in-office procedures.

Keywords

pain, in-office procedures, office-based procedures, pain management, otolaryngology

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In-office or office-based procedures are common throughout the field of otolaryngology.¹⁻³ They possess advantages of convenience, cost, and efficiency over procedures performed in the operating room.¹⁻³ Improved technology has ensured in-office procedures are safe and effective.¹ Procedures done on awake, nonsedated patients require the provision of periprocedural pain management, and adequate pain control improves tolerance, procedural success, and patient satisfaction.¹⁻³

Due to developing technology, cost considerations, and other advantages, the popularity of in-office procedures has grown.³ An estimated 12 million in-office procedures were performed in the United States in 2009.⁶ Various in-office periprocedural pain management techniques have been reported across medical subspecialties, with the richest literature in the field of obstetrics and gynecology.⁷ Not only does pain management support procedural success and improve patient care, but in the nonotolaryngology literature, periprocedural pain management also has been shown to strongly influence overall patient satisfaction and Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) ratings following surgery and awake procedures.⁸⁻¹⁰

The Joint Commission’s Pain Management Standards of 2000 encouraged the adoption of pain as the fifth vital sign,
enjoining pain measurement on providers at all levels of patient care.\textsuperscript{11} Adequate and appropriate pain assessment is a critical element in effective periprocedural pain management, and lack of pain assessment has been cited as one of the primary barriers to adequate pain control.\textsuperscript{12} Several validated pain management tools—such as the Visual Analog Scale, Numerical Rating Scale, and McGill Pain Questionnaire—have been introduced to improve and standardize pain assessment. However, there is no widespread consensus regarding the ideal methodology for periprocedural pain assessment, and as a result, many subjective and nonvalidated methods are employed.

Data regarding the safety and utility of in-office procedures have greatly outpaced information about pain control modalities and pain assessment methods in the otolaryngology literature. A multitude of in-office otolaryngology procedures have been described, commonly including flexible fiberoptic laryngoscopy or tracheoscopy, myringotomy and pressure-equalization tube insertion, endoscopic rhinoscopy, balloon sinuplasty, laryngeal injection or laser surgery, endoscopic intranasal intervention, biopsy of the head and neck, intraoral or airway lesions, and cosmetic injections. The majority of these procedures mandate some form of periprocedural pain control, and patient experience is likely improved by pain-minimizing interventions in nearly all reported procedures. Given the widespread utilization of in-office procedures in otolaryngology practices, the lack of information regarding assessment of periprocedural pain is concerning.

This systematic review was undertaken to gather the available data regarding pain assessment and control and to evaluate the efficacy of treatments during in-office otolaryngologic procedures. The objective was to determine whether, in patients undergoing awake, in-office procedures, periprocedural pain assessment and control measures are effectively applied to improve pain control for in-office procedures.

**Methods**

**Study Identification**

Searches of PubMed, CINAHL, and Web of Science were carried out by a single reviewer, with assistance from a medical librarian, from inception through January 2, 2018. Search functions were designed to incorporate 3 subsections connected by [AND] Boolean operators. The initial subsection contained MeSH and field-designated search terms related to pain and procedure tolerance. The second subsection specified MeSH and field-designated search terms for otolaryngology and otolaryngology-related procedures, while the third section contained MeSH and field-designated terms related to an office-based or clinic-based setting. Exact database search terms are reported in Appendix 1 (available in the online version of the article).

**Eligibility Criteria and Study Selection**

All search results were independently screened for inclusion by 2 authors (E.F. and B.C.). Initial screening included assessment of search result titles with exclusion criteria: (1) lack of availability in English, (2) explicit mention of pediatric patient population (defined as patients <18 years old), (3) explicit mention of nonotolaryngologic procedure, and (4) clear denotation of nonprocedural management of an otolaryngologic disease. Articles not meeting the above exclusion criteria subsequently underwent screening of abstracts with further exclusion criteria: (1) no report of procedural intervention, (2) report of procedure done under general anesthesia or intravenous sedation, (3) case report, (4) nonotolaryngologic procedure not previously screened out, and (5) pediatric patient population not previously screened out. Those articles not meeting abstract-based exclusion criteria then underwent screening of the full text with exclusion criteria: (1) previously noted exclusion criteria not detected in title or abstract screening and (2) no discussion of pain measurement or assessment in patients having an in-office procedure or intervention.

**Data Extraction**

Data extracted included study type, number of patients receiving the intervention of interest, method(s) of pain prevention or control employed by study clinicians, the methodology of postprocedural pain assessment used, and quantitative or qualitative data regarding patient reports of pain and whether or not steps were taken to change interventions based on patient feedback. Data regarding the efficacy, safety, and complications of in-office procedures fell outside the scope of the review question and were not collected. Data extraction was conducted by a single reviewer (E.F.).

**Evaluation of Risk of Bias**

The Risk of Bias Tool (RoB) was developed by the Cochrane Collaboration in 2005 and updated in 2011 in an effort to standardize the assessment of potential bias in randomized controlled trials.\textsuperscript{13} The tool analyzes bias in 6 domains and 7 potential sources to produce on overall estimate of the risk of bias for a trial. The Risk of Bias in Non-Randomized Studies of Interventions (ROBINS-I) tool, which was subsequently developed in a coordinated effort between the Cochrane Bias Methods Group and the Cochrane Non-Randomized Studies Methods Group as a means to systematize the analysis of nonrandomized studies, assesses potential bias across 7 key domains of study design and reporting to arrive at an overall estimation of bias for nonrandomized studies.\textsuperscript{14} Articles meeting inclusion criteria for this review were with either the RoB Tool or ROBINS-I tool as appropriate.

**Results**

**Included Studies**

A total of 2555 potential articles were identified after exclusion of duplicate records generated by separate database searches. After screening for inclusion and exclusion criteria as illustrated in Figure 1, 86 articles were found to meet full criteria for inclusion in the review. All included articles clearly reported on at least 1 method of periprocedural pain...
assessment following an in-office, otolaryngologic procedure done in an awake, adult patient.

Of the included studies, 9 were prospective randomized trials, 15-23 4 were prospective nonrandomized cohort studies,24-27 47 were prospective case series, 28-74 22 were retrospective reviews, 75-96 3 were cross-sectional surveys, 97-99 and 1 presented data from both a retrospective review and a prospective case series.100

A wide assortment of awake, in-office procedures was reported in all major subspecialties of otolaryngology, as detailed in Figure 2. Procedures most commonly reported included the diagnostic airway exam (including flexible laryngoscopy, tracheoscopy, and esophagoscopy as well as rigid laryngoscopy), vocal fold injection augmentation, balloon sinuplasty, and palatal surgery. Periprocedural pain management was addressed with medications in 76 studies. Seven studies did not use any pain modulators, and an additional 3 did not specify whether any intervention was applied while still reporting patient pain outcomes.

Periprocedural anesthesia varied between studies, with the most common methods being combined topical and local anesthesia, topical anesthesia only, and local anesthesia only (Figure 3). For the purpose of this review, the term local anesthesia refers to injection of a local anesthetic. Additional methods were primarily combinations of topical and/or local anesthesia with adjunctive oral or intramuscular analgesics and/or anxiolytics. A total of 8 studies reported the use of nerve blocks, oral or intramuscular analgesics, or oral anxiolytics (Figure 3). Three studies compared different methods of pain control for the same in-office procedure with the purpose of evaluating which was better: Bonaparte et al16 (n = 22, 2011) (topical lidocaine vs saline), Sharma and Verma100 (n = 38, 2015) (nebulized lidocaine with or without lidocaine drip), and Young et al23 (n = 108, 2014) (atomized or “syringe-spray” delivery of lidocaine/neosynephrine). All other studies employing pain modulators did not use any form of comparison.

**Pain Assessment Methodology**

Methodology of pain assessment varied dramatically between included studies (see Supplemental Table S1, available in the online version of the article). The validated Numerical Rating Scale (0-10) was used in 4 studies, 19,24,48,54 while 11 studies made use of other numeric scales with ranges of 0 to 5,63 1 to 5,18 and 1 to 10,31,39,45,67,75,80,97-99 A Visual Analog Scale (VAS) was used by 18 studies.* Verbal Rating Scales (VRS) were used in 11 studies and included 11-point VRS,40 6-point VRS,28,29 5-point VRS,43,56,100 and 4-point VRS.30,36,53,58,84 The Wong-Baker FACES scale was used in 2 studies and the McGill Pain Questionnaire in 2 as well.38,63 The Iowa Satisfaction with Anesthesia Scale was used by a single study.66 Patient tolerance—as assessed via a patient’s ability to complete the entirety of a procedure—was the primary pain assessment method in 22 studies, and was reported as a secondary assessment of postprocedural pain in 2 additional studies.72,100 A binary (yes or no) assessment of pain was used by 2 studies.77,78 Self-report of pain by the patient was collected primarily in 6 studies and was a secondary measure in 1 study.41 Patient appearance of pain—as ascertained by the clinician—was used in 1 study.43 Postprocedural oral analgesic use assessed by (1) need for oral analgesics, (2) duration of oral analgesic use, or (3) total amount of oral analgesic taken was the sole pain assessment methodology in 2 studies17,18 and was reported as a secondary measure in 11 other studies.4 The duration of functional limitation following a procedure was the sole pain assessment in a single study.42 Patient willingness to recommend the procedure to another person was assessed by 3 studies.44,56,72 Two studies failed to specify a means of postprocedural pain assessment in their methodology but subsequently reported minimal to mild postprocedural pain in their results.50,71

Of the included studies, only 45% made use of a previously validated methodology of pain assessment, with 55% relying on nonvalidated means of pain measurement. Thirty-five studies used discrete, ranked scales such as the NRS or VAS, and of these, appropriate verbal anchors were


†References 33, 35, 41, 49, 73, 74, 76-79, 81-83, 86, 88, 89, 90-92, 94-96.


used in only 22.\textsuperscript{11} Eleven studies either did not use verbal anchors or were unclear regarding their use.\textsuperscript{6} Two of the studies using a nonvalidated numerical scale also used non-standard verbal anchors, with adjectives applied beyond the standard greatest and least numeric values.\textsuperscript{45,97} Qualitative pain assessment was undertaken in only 3 studies\textsuperscript{38,45,63} and a baseline, preprocedural pain assessment in only 5 studies.\textsuperscript{15,38,44,65,87} Only 1 study included baseline pain medication usage, and no studies mentioned the presence or absence of other pain syndromes.\textsuperscript{36}

**Risk of Bias Assessment**

Overall study quality for all prospectively randomized trials, as assessed by the Cochrane RoB tool, was determined to be fair in 3 studies and good in the remaining 6 randomized studies (see Supp. Tables S2 and S3 in the online version of the article). Bias in nonrandomized trials, as per the ROBINS-I criteria, was moderate in 71 studies and serious in 6 studies. As the primary data evaluated in this review were not a reported study outcome but rather an action reported by the study authors, studies having moderate or serious overall bias on the ROBINS-I tool or fair overall quality on the RoB tool were included in the final analysis. Similarly, as not all randomized studies assessed via the RoB tool were true randomized controlled trials, the determination of study quality may be skewed; however, as the outcome of interest for the review was not a primary end point in any randomized study included, the application of the RoB tool to a randomized, noncontrolled trial is not felt to alter the validity of the extracted data.

**Discussion**

Performing procedures in the office instead of the operating room provides cost and time advantages and avoids
general anesthesia, but success and patient-perceived quality through pain control and comfort depend on the provision of appropriate analgesia. Accurate and relevant pain assessment is a critical initial step in successful pain control, but studies of postoperative pain have shown that these assessments are often woefully lacking.

In the era of quality-driven metrics and reimbursement, an important contributor is pain measurement, which has been shown to improve self-reported patient satisfaction and HCAHPS scores. This review was designed to compile all of the methods used for pain assessment and control during otolaryngologic in-office procedures, while also collecting examples of applications of these data to improve patient experience and tolerance of those procedures.

It is generally accepted that in order for procedures to be successful, adequate pain control must be provided, and all but 10 of the 86 studies of in-office otolaryngology procedures reported techniques employed to minimize periprocedural pain. Most of these were topical and local anesthetics, but it is notable that other options have been introduced. Two studies reported the use of nerve blocks where anatomically feasible, while others employed oral analgesics and oral anxiolytics. The use of anxiolytics is an important adjunct that is often overlooked in pain management and addresses the affective components of the pain experience demonstrated in a few of these studies. Although the efficacy of these interventions was directly assessed through comparison in only 3 studies, they offer additional options that may be applied to improve the patient experience and therefore tolerance of in-office procedures. It should be noted, however, that given the heterogeneity of procedures reported in the literature, appropriate and practical pain control options will vary based on the procedure in question.

There are a multitude of methods for pain assessment, supporting the highly subjective and variable definitions of pain and the patient experience. As in available data from other medical specialties, this review revealed significant heterogeneity in the methods of pain assessment employed for otolaryngology in-office procedures. Eighty-six studies described 12 distinct methods of periprocedural pain assessment during in-office procedures. Scales validated in pain or behavioral medicine literature were used in fewer than half of the included studies. Nonstandardized, subjective questioning regarding pain was used by 2% of studies while objective measures such as analgesic use and functional limitations were incorporated by 16% of included studies. In 35% of studies, assessment of patient pain was made without direct questioning of the patients regarding their pain levels, instead relying on unprompted reports of pain, ability to complete the procedure, or appearance of pain (as judged by the study clinician) as surrogates. Multiple studies have demonstrated minimal correlation between a clinician’s assessments of a patient’s pain and the patient’s own self-report. Thus, methods of pain assessment that rely primarily on clinician judgment are likely poor measures of the pain experienced by patients. Only 5 studies measured pain with the inclusion of a baseline pain assessment. No studies took into comprehensive account the pain history of the patients: chronic pain medicine usage, pain syndromes, or history of narcotic abuse, all of which can affect the experience of pain and procedure tolerance.

One of the more prevalent measures of periprocedural pain revealed in this review was patient tolerance as ascertained by the ability to complete the procedure without patient-prompted termination due to discomfort or pain. While this is certainly an important marker of a procedure’s feasibility, relying solely on this marker—as seen in 23 studies in this review—is an insufficient pain assessment method. Notably, a number of the studies reporting both patient tolerance and an additional method of pain assessment demonstrated discrepancies between tolerance levels and the additional reported measures. Faust et al (n = 10, 1996) reported 100% tolerance of palatine tonsil biopsy, but only 80% of patients indicated their willingness to repeat the procedure where deemed necessary. Young et al (n = 154, 2012) noted 95% tolerance of varied laryngology procedures but reported VAS scores ranging from 0 to 87 with an average (SD) of 37 (23). Taken together, these accounts suggest that patients indeed may tolerate a procedure while still experiencing pain that could be better controlled. Tolerance does not provide a target for intervention or improvement. Periprocedural pain and tolerance are 2 different concepts, the former rightly a component of informed consent and a target for intervention and the latter the ultimate determinant of whether a procedure can be performed in the office setting.

Patient satisfaction is a multifactorial issue, but in regard to invasive procedures, satisfactory pain management plays a major role. Two recorded concepts noted by several included studies in this review were (1) the willingness of the patient to repeat the procedure and (2) the willingness of the patient to recommend the procedure to another individual. Laryngology and rhinology procedures were most commonly studied, likely reflecting the volume of diagnostic as well as therapeutic procedures that are performed in the clinic in these subspecialties. Patient willingness to continue undergoing said procedures significantly affects a provider’s practice patterns. Again, satisfaction scores do not directly mirror the procedure-related pain scores. Cohen et al (n = 305, 2003) reported a 98% willingness to repeat fiberoptic endoscopic evaluation of swallowing while indicating that 7.5% and 33% of patients scored pain as severe and moderate, respectively, on a 4-point Likert scale. Similarly, Albritton et al (n = 37, 2012) found that 95% of patients would repeat in-office balloon sinus dilation despite a VRS score of 5/5 pain in 5.6% and 4/5 pain in 8.3%.

Comparisons between different interventions for pain using validated pain assessment tools to improve pain control were not present in the included otolaryngology literature pertaining to in-office procedures. Instead, this systematic review yielded a summary of interventions for pain control that have been applied as well as a widely varying range of methods for pain assessment with equally
variable validity and applicability. Future efforts may include more standardized assessments of pain with validated measures of both sensory and affective components of pain with baseline measures and appropriate follow-up in an effort to provide targets for intervention and improve patient tolerance and procedural success.

There are limitations to this study. Primarily, as a systematic review, the results reported are limited by their inclusion in the literature and the clarity and quality of available studies. Two studies included in this review, while clearly reporting postprocedural patient pain, neglected to explicitly state their method of pain assessment. These articles highlight the inherent difficulty in evaluating provider practices regarding pain assessment, particularly considering that periprocedural pain is often considered a secondary outcome—overshadowed by procedure success and safety. This potential for underreporting of provider practices in the area of pain assessment thus makes it possible that the results generated by this review poorly reflect the common practice patterns. Similarly, the wide variety of procedures represented in the literature and differing amounts and types of pain associated with each procedure make generalization of pain assessment across procedures difficult. Also notable was the significant heterogeneity in the quality of included studies for this review. While this was felt not to affect the primary results relevant to this review question, it does limit the conclusions that can be drawn from any specific data discussed. Meta-analysis of quantitative pain outcomes was not appropriate given the heterogeneity in study quality, varied procedures described, and wide range of outcomes presented in the included studies.

Conclusion

This systematic review was undertaken to characterize the methods of periprocedural pain prevention and assessment in otolaryngologic in-office procedures while also compiling reported efficacy of such measures. The results of this review indicate that although many reports include measures and management of pain for in-office procedures in the otolaryngology literature, few employ validated measures, few are standardized, and current data do not support any specific pain control measures over others. Data that can be applied to support the development of periprocedural pain control protocols are sparse, and there is significant opportunity to investigate the best methods for improving patient pain and tolerance of in-office procedures.

Author Contributions

Ethan Frank, study design, data collection, manuscript drafting, manuscript editing, approved final version to be published, agrees to accountability for all aspects of the work; Bradley Carlson, data collection, manuscript editing, approved final version to be published, agrees to accountability for all aspects of the work; Amanda Hu, data collection, manuscript editing, approved final version to be published, agrees to accountability for all aspects of the work; Derrick R. Randall, data collection, manuscript editing, approved final version to be published, agrees to accountability for all aspects of the work; Shanalee Tamares, study design, manuscript editing, approved final version to be published, agrees to accountability for all aspects of the work; Jared Inman, study design, manuscript drafting, manuscript editing, approved final version to be published, agrees to accountability for all aspects of the work; Brianna K. Crawley, study design, manuscript drafting, manuscript editing, approved final version to be published, agrees to accountability for all aspects of the work.

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Supplemental Material

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