Systematic Review and Meta-Analysis in Facial Plastic Surgery

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KEYWORDS

- Systematic review • Meta-analysis • Facial plastic surgery • Rhinoplasty • Rhytidectomy
- Local flap • Reconstruction • Evidence-based medicine

KEY POINTS

- Systematic reviews of the literature involve rigorous methods analogous to primary research studies. Investigators collect, analyze, and interpret data in an explicit, reproducible manner to avoid bias.
- Meta-analysis involves statistical pooling of data derived from multiple studies. To avoid bias in data selection, meta-analyses should be based on an underlying systematic review.
- Systematic reviews and meta-analyses strengthen the evidence base in facial plastic surgery. Functional rhinoplasty, facial reanimation, facial reconstruction, and wound healing are among several areas with potential for enhancing level of evidence.
- In facial plastic surgery, accruing well-designed original studies improves the data set available for systematic reviews and meta-analyses.
- Current challenges include limited numbers of studies, weaknesses of study design/methods, and inconsistency in outcomes and definitions.

INTRODUCTION

Facial plastic and reconstructive surgery is a highly specialized but remarkably diverse specialty, ranging from cosmetic rhinoplasty and facial rejuvenation surgery to craniofacial trauma reconstruction, cleft lip and palate surgery, microvascular surgery, and facial reanimation. In an era of evidence-based medicine, this diversity presents unique challenges and opportunities for facial plastic surgeons. Patients, practitioners, policymakers, and third-party payers all increasingly seek evidence-based answers to specific clinical questions: How prevalent is this clinical problem? What are the risk factors for a particular complication? How effective is one surgical procedure compared with another? Systematic reviews and meta-analyses provide transparent and rigorous summaries of the best available evidence. They are an important addition to the literature because the conclusions play a critical role in developing practice guidelines, identifying gaps in knowledge, defining surgical quality metrics, and allocating resources.

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WHAT IS A SYSTEMATIC REVIEW

Early efforts to summarize evidence in clinical medicine took the form of narrative expert reviews. They lacked clear structure and were subject to the author's bias in the selection of the literature and the synthesis of the findings. Conversely, the systematic review follows a structured and reproducible process for searching, selecting, and summarizing the available evidence. This process minimizes bias and provides transparent and reliable answers to clinical questions. The process starts with formulating a focused clinical question and is followed by a comprehensive review of the medical literature. Explicit criteria then determine which studies are used to formulate a clinical summary of the findings. Systematic reviews with meta-analyses can summarize the best available evidence to answer many clinical questions in facial plastic surgery.

HOW TO CONDUCT A SYSTEMATIC REVIEW

The systematic review is analogous to primary research in that one reports methods, data collection, and analysis. First, one defines a focused review question and specifies a search strategy of the medical literature that captures most, if not all, of the relevant literature.[1] The review proceeds to identify the eligible studies and evaluate the quality of the available evidence. Frequently, a systematic review is then combined with a meta-analysis, although they are methodologically distinct.

Defining the Research Question

The first, and sometimes most difficult, step is to define the objective of the systematic review. This objective can usually be expressed as a specific clinical question. The acronym PICOT is sometimes used to describe key components of the research question: *P*opulation, *I*ntervention, *C*omparison, *O*utcome, and *T*ime. It is advisable to survey the available literature to guide the development of a feasible research question. This consideration is particularly relevant in facial plastic surgery, where the small sample size, difficulty of randomizing surgical patients, and the inconsistent outcome measures limit the research data. It is important to determine whether the research question is dealing with cause, diagnosis, intervention, prognosis, or cost. The type of the research question dictates the most suitable study design and the potential biases that may influence findings. For example, when one wants to evaluate if perioperative steroids decrease perioperative edema and ecchymosis following rhinoplasty, the highest quality studies should be randomized clinical trials (RCTs). However, if the review question is examining which facial nerve outcome scale has the best reliability and validity, the studies are cohorts of patients with facial nerve deficit.

Developing a Search Strategy

Systematic reviews are distinguished from other reviews by the well-structured, explicit, and reproducible search strategy. The strategy is designed based on the PICOT components of the review question. Although the goal is to capture all the relevant studies, increasing the comprehensiveness (or sensitivity) of a search reduces its precision and therefore yields many nonrelevant studies. The search should strike a favorable balance between being comprehensive, yet relevant and manageable. Navigating though databases, such as MEDLINE, EMBASE, or CENTRAL, can be technically demanding, and collaborating with a health care librarian is strongly recommended. Each database has developed specific "controlled vocabulary" and filters to retrieve the studies of interest from millions of publications. It is important that the search is performed in more than one database using controlled vocabulary and regular text words. Filters and limit terms can be added to refine the search, such as a language, publication date, study design, or population age. Although most systematic reviews are limited to the published literature, some review questions call for searching though dissertations, trial registries, meeting abstracts, or even contacting agencies or health providers. This is important in areas were publication bias is thought to heavily influence the results, such as adverse events and complications. Finally, the retrieved articles from several databases and any unpublished articles are merged together in a master library and duplicates removed. **Fig. 1** illustrates the value of a comprehensive search strategy that uses more than one database and possibly includes unpublished results.

Identifying the Evidence

Once the pool of candidate articles has been accumulated, the reviewers then determine which articles meet the defined criteria for inclusion. The inclusion and exclusion criteria should be clearly specified a priori. It is typical for the search to retrieve several hundreds or even thousands of articles that need to be distilled to reach a handful of eligible studies. This process is often done in two stages. First, the reviewers screen the titles and abstracts to identify any potential articles. Subsequently, two independent reviewers evaluate the screened publications using the inclusion and exclusion criteria.