

**Title of submitted paper and corresponding author:** [Treatment of recalcitrant maxillary sinusitis with endoscopic modified medial maxillectomy: A systematic review of safety and efficacy, Corresponding author: Zachary Soler, M.D., M.Sc.

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#	Guidance	On page #	Manuscript Quote / Author Comments
Title			
1	Identify the report as a systematic map.	2	Type of Article: Review Article
Abstract			

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2	<p>Provide a structured summary including, as applicable:</p> <ul style="list-style-type: none"> <li>• Background;</li> <li>• Objectives;</li> <li>• Data sources;</li> <li>• Study eligibility criteria;</li> <li>• Study appraisal methods, if conducted;</li> <li>• Results;</li> <li>• Limitations; conclusions and implications of key findings;</li> <li>• Systematic map registration number.</li> </ul>	4-5	<p><b>Background:</b> Endoscopic sinus surgery is an effective treatment option for patients with chronic rhinosinusitis (CRS), although approximately 20% of patients fail to improve with standard surgical procedures. Expanded procedures such as the endoscopic modified medial maxillectomy (EMMM) have been described in management of refractory maxillary sinusitis.</p> <p><b>Objective:</b> This study aims to review the current literature on the safety and efficacy of the EMMM for treatment of refractory maxillary sinusitis.</p> <p><b>Methods:</b> A literature search was performed of Pubmed, Ovid and Cochrane databases according to the Preferred Reporting Items for Systematic Review and Meta-Analyses guidelines. English-language articles evaluating the EMMM procedure on patients with recalcitrant maxillary sinusitis were included. Full text articles were obtained and evaluated by two reviewers independently, with a third reviewer for mediation of disagreements.</p> <p><b>Results:</b> Six studies met eligibility criteria and were included into the study, with follow-up ranging from 12 to 82.8 months. Two studies contained level 2 evidence and 4 studies contained level 4 evidence. EMMM was found to be effective in CRS and</p>

# PRISMA Report (modified) for Systematic Maps Submitted to *Environment International*

Version 1.0, 24 Feb 2017. This form is to be completed as supplemental information alongside any systematic map submitted to *Environment International*. Authors are asked to provide relevant quotes in addition to page numbers.

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<b>Introduction</b>			
3	Describe the rationale for the map.	6-7	Previous studies on EMMM have been limited by variation in reporting of outcome metrics, small sample sizes and short follow up times, making it difficult to draw conclusions from any single study. Though the EMMM procedure is often utilized for access in non-inflammatory maxillary sinus surgeries, the focus of this study was on its utility in chronic maxillary sinusitis. The purpose of this current study was to perform a systematic review of the literature to report on the safety and efficacy of salvage EMMM for persistent disease in the treatment of recalcitrant chronic maxillary sinusitis.
4	Define primary and secondary questions for the systematic map.	6-7	to report on the safety and efficacy of salvage EMMM for persistent disease in the treatment of recalcitrant chronic maxillary sinusitis.
<b>Methods</b>			
5	Indicate if a map protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	8-9	Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) guidelines, <a href="http://www.prisma-statement.org">http://www.prisma-statement.org</a>

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6	Specify characteristics of study reports used as criteria for eligibility, giving rationale.	8-9	Inclusion criteria included English language articles and reporting of data regarding the outcomes of EMMM performed on patients with a diagnosis of CRS. Studies were excluded if they consisted of less than 10 patients and no follow up was reported.
7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	8-9	PubMed, Scopus and Cochrane Database of Systematic Reviews
8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	8-9	The PubMed and Cochrane searches each included two search domains which were connected by “AND.” The terms within each discreet domain were combined with “OR.” The first of the two included the terms mega antrostomy, modified maxillectomy, extended maxillectomy, meatal antrostomy, meatus antrostomy, and maxillary antrostomy. The second domain included sinusitis and rhinosinusitis. Scopus search was performed using three domains. The first of which included the terms mega, modified, extended, meatus, meatal, medial, middle and maxillary. Antrostomy and maxillectomy made up the second domain and the third domain was limited to sinusitis and rhinosinusitis.

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9	State the process for selecting studies (i.e., screening, eligibility, included in systematic map).	8-9	After initially screening by title and abstract, full-text articles were obtained and evaluated by two reviewers independently (C.L. and V.D.). Disputes were mediated by the senior author (Z.M.S.). Articles meeting inclusion criteria were included in the systematic review.
10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	8-9	Data extracted included author, year of publication, number of subjects, age (mean), follow-up time (mean), complications, symptom resolution (%), 22-item Sinonasal Outcomes Test (SNOT-22) scores, Lund-Mackay scores, Lund-Kennedy endoscopy scores, culture results and revision surgery rates.

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11	List and define all variables for which data were sought and any assumptions and simplifications made.	8-9	<p>Data extracted included author, year of publication, number of subjects, age (mean), follow-up time (mean), complications, symptom resolution (%), 22-item Sinonasal Outcomes Test (SNOT-22) scores, Lund-Mackay scores, Lund-Kennedy endoscopy scores, culture results and revision surgery rates. The SNOT-22 is a test designed to assess sinus-specific QOL; it contains 22 questions scored from 0-5 and gives a total score from 0-110, with higher scores indicating a greater impact on sinus-specific QOL. The Lund-Mackay (LM) score is a measure of sinus opacification with a total score between 0 and 24, with higher score indicating greater opacification.<sup>8</sup> The modified Lund Kennedy score is scored from 0-12 which grades polyps, edema and discharge, but does not report on scarring or crusting.<sup>9</sup></p>

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12	If conducted, describe methods for assessing quality of individual studies.	8-9	There were a total of 6 studies that met eligibility criteria and were included into the study (Figure 1). <sup>5, 7, 10-13</sup> Across these studies, a total of 255 patients underwent expanded surgery with EMMM for chronic maxillary sinusitis, with follow-up ranging from 12 months to 82.8 months. Of the articles included in this review, 2 articles contained level 2B evidence (well-designed cohort study), <sup>5,7</sup> and 4 contained level 4 evidence (poorly designed cohort studies) based on Oxford Center for Evidence-based medicine Levels of Evidence. <sup>10-14</sup> One study reported entirely on CF patients with CRS, and the other 5 reported on non-CF CRS patients. <sup>7</sup> A summary of the included articles can be found in Tables 1 and 2.
<b>Results</b>			
13	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, illustrated with a PRISMA flow diagram.	10	Our initial search yielded 286 abstracts, from which duplicates were removed and two rounds of review performed on abstract and full manuscript text. There were a total of 6 studies that met eligibility criteria and were included into the study

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14	Show how the relevant literature is organised (categories, coding etc.) according to transparent, replicable criteria. This map should be readily updateable.	10-13	Safety, patient-reported outcome metrics, objective metrics, revision surgery, culture results
15	Present map of study quality and preliminary estimate of the quality of the evidence base.	10-13	Of the articles included in this review, 2 articles contained level 2B evidence (well-designed cohort study), <sup>5,7</sup> and 4 contained level 4 evidence (poorly designed cohort studies) based on Oxford Center for Evidence-based medicine Levels of Evidence. <sup>10-14</sup>
Discussion			



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16	Observe distribution of articles, relative quantity, quality etc. as relevant to map objectives.	14-17	Although medical management and ESS are standard interventions, there are a proportion of patients for which these measures are unsuccessful. Findings from this systematic review suggest that EMMM is a safe and well-tolerated procedure for refractory chronic maxillary sinusitis, associated with significant reduction in symptomatic burden and relatively low complication rates. Though reporting of outcomes was variable throughout the articles included in this review, the vast majority of patients (60-80%) achieved significant or complete resolution of symptoms with none worsening following surgery. <sup>5, 10, 13</sup> In addition, studies that reported LM and LKES scores showed statistically significant improvements post-operatively, indicating that EMMM may lead to both objective and subjective improvement in disease control. <sup>5, 7</sup>

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17	Describe limitations of the map, such as limitations in search strategy, potential bias in pool of retrieved articles, etc.	18	<p>Limitations include a lack of standardization in data collection and wide variation in reported outcomes, making it difficult to draw meaningful comparisons across studies.</p> <p>Furthermore, follow up times were insufficient to assess long-term outcomes in many cases. Future studies should be well-designed and offer comprehensive reporting of pertinent metrics including standard use of validated patient-reported symptom questionnaires.</p>

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18	Describe both policy and management implications, and implications for research.	19	<p>In instances where EMMM is needed, it is an effective procedure that can be utilized as a salvage option in chronic maxillary sinusitis that is refractory to other treatments. To date, there are no randomized clinical trials evaluating the efficacy of the EMMM procedure in recalcitrant chronic maxillary sinusitis. However, with the studies evaluated in this review, the EMMM procedure appears to be a safe and effective option in treatment of these patients. Outcomes demonstrate high rates of complete and partial symptom resolution and meaningful improvements in CT and endoscopy scores. Complication rates and revision rates are low, but nasolacrimal duct injury is a potential complication which appears to occur more frequently in this procedure compared to traditional ESS. Future studies with larger patient populations and longer follow up duration would be helpful to gain further insight into the long-term success rates of these procedures.</p>
<b>Funding</b>			
19	Describe sources of funding for the map, other support, and role of funders.	1	There was no source of funding for this study.

*Environment International* modified PRISMA report adapted from: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097 and *Environmental Evidence* "Preparing your manuscript: Systematic Map" <http://environmentalevidencejournal.biomedcentral.com/submission-guidelines/preparing-your-manuscript/systematic-map> (retrieved 24 February 2017)