MICRODEBRIDER ASSISTED TURBINOPLASTY FOR NASAL OBSTRUCTION IN INFERIOR TURBINATE HYPERTROPHY: A SYSTEMATIC REVIEW AND META-ANALYSIS

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ABSTRAK

Pengenalan: Masalah hidung tersumbat kerap disebabkan oleh hipertropi turbinat rendah dan mikrodebrider adalah kaedah baru untuk turbinoplasti dengan mengekalkan mukosa saluran hidung.

Objektif: Objektif kajian ini adalah untuk mengkaji keberkesanan turbinoplasti mengunakan microdebrider berbanding teknik piawai yang lain. Tujuan utama kajian ini adalah untuk menilai kelegaan dalam penyumbatan hidung. Objektif kedua kami adalah untuk menilai kelegaan bagi simptom dan komplikasi hidung lain yang berkaitan dengan teknik ini.

Kaedah: Kami telah memperoleh kajian percubaan klinikal dari Cochrane Register of Controlled Trials CENTRAL yang merangkumi MEDLINE. Perisian Review Manager 5.3.5 digunakan untuk melakukan meta-analisis.

Keputusan: Kami telah memperoleh 124 rekod dari carian pangkalan data elektronik dan sumber-sumber lain. 11 percubaan dimasukkan dalam kajian sistematik dan 10 percubaan dalam meta-analisis. Terdapat pengurangan dalam hidung tersumbat pada kumpulan mikrodebrider jika dibandingkan dengan radiofrekuensi (SMD -0.58, 95% CI -1.01 hingga -0.15; P = 0.008, I2 = 76%; 4 kajian, 400 pesakit). Namun, tidak ada perbezaan jika dibandingkan antara mikrodebrider dan reseksi submukosa (MD -0.10, 95% CI -0.36 hingga 0.15; P = 0.13, I2 = 57%; 2 kajian, 280 pesakit). Tidak ada perbezaan antara mikrodebrider dan radiofrekuensi atau reseksi submukosa dalam pengurangan simptom hidung lain. Pendarahan meningkat pada kumpulan mikrodebrider jika dibandingkan dengan radio frekuensi tetapi tiada perbezaan jika dibandingkan dengan reseksi submukosa. Walau bagaimanapun, kerak adalah kurang pada kumpulan mikrodebrider berbanding dengan kumpulan reseksi submucosal.

Kesimpulan:. Mikrodebrider menawarkan kaedah alternatif yang selamat untuk turbinoplasti. Walau bagaimanapun, keberkesanan mikrodebrider tidak dapat dipastikan sehingga kajian-kajian yang baru dijalankan .

ABSTRACT

Introduction: Common cause of nasal obstruction is inferior turbinate hypertrophy and microdebrider is a new method for inferior turbinoplasty that preserves mucosa.

Objective(s): The objective of this study is to examine the efficacy of microdebrider assisted inferior turbinoplasty compared to other standard techniques. Our primary outcome is to assess the relieve in nasal obstruction. Our secondary objective is to assess the relieve of other nasal symptoms and complications related to these techniques.

Methods: We retrieved trials from the Cochrane Register of Controlled Trials CENTRAL which includes MEDLINE. We used Review Manager 5.3.5 software to perform the meta-analysis.

Results: We retrieved 124 records from the search of the electronic database and other sources. 11 trials were included systematic review and 10 studies in meta-analysis. There is a reduction in nasal obstruction in the microdebrider group when compared to radiofrequency (SMD -0.58, 95% CI -1.01 to -0.15; P=0.008, I^2=76%; 4 studies, 400 patients). However, there is no difference when compared between the microdebrider and submucosal resection (MD -0.10, 95% CI -0.36 to 0.15; P=0.13, I^2=57%; 2 studies, 280 patients). There is no difference between microdebrider and radiofrequency or submucosal resection in reduction of other nasal symptoms. Hemorrhage is increased in the microdebrider group when compared to radiofrequency but no difference when compared with submucosal resection. However, crusting was noted to be less in the microdebrider group when compared with submucosal resection group.

Conclusion(s): Microdebrider offers an alternative, safe method for inferior turbinoplasty. However, the efficacy of the microdebrider is unsure until new trials are available to make a further recommendation.

CHAPTER 1

INTRODUCTION

Description of the condition

Nasal obstruction is one of the most common complaints among patients presenting to otorhinolaryngologists (Al-Helo 2018). Although nasal obstruction is not life-threatening, it may have a significant impact on the quality of life of patients (Romano 2015). Nasal turbinates are arched bone structures distributed in the anterior-posterior nasal cavities. The anterior end of the inferior turbinate is the narrowest part of the nasal airway, and the hypertrophy of this can cause significant nasal obstruction (Kumar 2014). These turbinates play a crucial role in the balance of temperature, humidity, and the filtration of the inhaled air.

The common causes of nasal congestion are rhinitis, both allergic and non-allergic, rhinosinusitis, and nasal polyposis. These types of congestions are caused by physical obstruction of nasal passages. Nasal obstruction canal is caused by modulation of sensory perception (Necralio 2010). Nasal obstruction caused by inferior turbinate hypertrophy can either be caused by bone hypertrophy with normal mucosa, as a result of anomalous or traumatic development or caused by hypertrophy with abnormal thickening of the mucosa of the turbinates which is caused by acute or chronic inflammation (Al-Helo, 2018). Both components (bone and mucous) may, separately or jointly (most common), be responsible for the inferior turbinates, which manifests clinically by a nasal obstruction (Al-Helo, 2018).

These inflammations are contributed by a wide range of biologically active agents, e.g., histamine, tumor necrosis factor-α, interleukins, and cell adhesion molecules. The inflammation would manifest as venous engorgement, increased nasal secretions, and tissue swelling/edema, ultimately leading to impaired airflow and the sensation of nasal congestion. Inflammation-induced changes in the properties of sensory afferents (e.g., expression of peptides and receptors) that innervate the nose can

also contribute to altered sensory perception, which may result in a subjective feeling of congestion (Necralio 2010).

Turbinate hypertrophy results in nasal obstruction, mouth breathing, snoring, and retention of secretion (Bandos 2006). It occurs mostly in the age group 20-60 years, due to anatomical or vasomotor, endocrine, allergic, or irritant factors. Epidemiological investigations in Europe have reported rates ranging from 10% to 20% of the population who had some type of respiratory allergy (Seeger 2003).

Increased understanding of the mechanisms underlying inflammation can facilitate improved treatment selection and the development of new therapies for congestion. First-line treatment of this disease is pharmacological. In the event, the standard medical treatment with steroids, topical decongestants, and antihistamines are not adequate, a surgical treatment for the inferior turbinate hypertrophy should be performed (Romano 2015). Various surgical options are present, which include microdebrider, laser argon, Carbon dioxide laser, radiofrequency, cryocoagulation, total turbinectomy, partial turbinectomy, and submucosal ablation by electrocautery (Kumar 2014).

Description of the intervention

The ideal turbinate surgery would be limited to the erectile submucosal tissue and the bony turbinate. The reduction of bone would create more space, while surgery on submucosal tissue creates scarring minimises the engorgement of the inferior turbinate (Friedman 1999). Preservation of mucosa improves the chances of continuation of normal nasal physiology to warm and humidify the inspired air. However, many of the techniques involve the treatment of submucous tissue with the sacrifice of mucosa (Kumar 2014). The examples would be partial or total turbinectomy, cryosurgery, electrocautery, and laser. They would destroy the mucosa, and these, in turn, would interrupt the normal nasal physiology (Kumar 2014). It can cause an increased risk of throat dryness, nasal crusting,

nasal bleeding, synechia formation, osteitis, atrophic rhinitis, and inadequate volume reduction (Lee 2004).

The use of a microdebrider for the surgical treatment of hypertrophic turbinates was only reported by Davis and Nishioka in 1996 (Al-Helo 2018). Microdebrider-assisted inferior turbinoplasty (MAIT) may be performed intraturbinally (removal of submucosal tissue via a submucosal pocket) or extraturbinally (trimming of the turbinate's mucosal surface) according to the volume of the submucosal tissue and surgeon's preference. However, these surgical techniques are mainly focused on mucosal volume reduction of the inferior turbinate to relieve the nasal obstruction (Lee 2013).

How the intervention might work

A systemic review and meta-analysis comparing the Radiofrequency Ablation Turbinoplasty versus Microdebrider Assisted Turbinoplasty revealed that these techniques have positive short-term improvements. Although there was no significant difference noted for one technique over the other, the two largest, highest quality studies favored microdebrider-assisted turbinoplasty (Acevedo, 2000). However, there are many other techniques for inferior turbinoplasty. Other techniques are compared to microdebrider assisted technique to establish the efficacy of microdebrider assisted technique in inferior turbinate hypertrophy.

Why is it important to do this review

The variety of surgical techniques available indicates the lack of consensus on the optimal technique. The literature review is mostly comparing microdebrider with one other technique; for example, microdebrider assisted inferior turbinoplasty comparing with radiofrequency assisted inferior turbinatoplasty. Directly comparing one technique to another technique would not be able to give a

clear overview of the advantages of each technique and its related complications. If it can be shown that the microdebrider is superior to other techniques for inferior turbinoplasty, the patients would have a better outcome with minimal complications.

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CHAPTER 2

OBJECTIVES

The objectives of this systematic review and meta-analysis were to examine the efficacy, and adverse effect of microdebrider assisted inferior turbinoplasty compared to other standard techniques in patients with inferior turbinate hypertrophy.

Primary outcome

1. Nasal obstruction

Secondary outcomes

1. Complications such as bleeding, infection, synechiae
2. Nasal symptoms such as rhinorrhoea, sneezing, snoring, hyposmia, headache, postnasal drip
3. Duration of operation
4. Relapse of nasal obstruction

CHAPTER 4

MANUSCRIPT

Title page

Microdebrider assisted turbinoplasty for nasal obstruction in inferior turbinate hypertrophy: A systemaric review and meta-analysis

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Abstract

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Conclusion(s): Microdebrider offers an alternative, safe method for inferior turbinoplasty. However, the efficacy of the microdebrider is unsure until new trials are available to make a further recommendation.

Key Words: Microdebrider, Inferior turbinoplasty, Radiofrequency, Submucosal resection, Diode laser.

1 Introduction

Nasal obstruction is one of the most common complaints among patients presenting to otorhinolaryngologists.[1] Although nasal obstruction is not life-threatening, it may have a significant impact on the quality of life of patients.[2] The anterior end of the inferior turbinate is the narrowest part of the nasal airway, and the hypertrophy of this can cause significant nasal obstruction.[3] These turbinates play a crucial role in the balance of temperature, humidity, and the filtration of the inhaled air.

Turbinate hypertrophy results in nasal obstruction, mouth breathing, snoring, and retention of secretion.[4] It occurs mostly in the age group 20-60 years, due to anatomical or vasomotor, endocrine, allergic, or irritant factors.

First-line treatment of this disease is pharmacological. In the event, the standard medical treatment with steroids, topical decongestants, and antihistamines are not adequate, a surgical treatment for the inferior turbinate hypertrophy should be performed.[2] Various surgical options are present, which include microdebrider, laser argon, Carbon dioxide laser, radiofrequency, cryocoagulation, total turbinectomy, partial turbinectomy, and submucosal ablation by electrocautery.[3]

The ideal turbinate surgery would be limited to the erectile submucosal tissue and the bony turbinate. The reduction of bone would create more space, while surgery on submucosal tissue creates scarring minimises the engorgement of the inferior turbinate.[5] Preservation of mucosa improves the chances of continuation of normal nasal physiology to warm and humidify the inspired air. Destruction of the turbinate mucosa can result in an increased risk of throat dryness, nasal crusting, nasal bleeding, synechia formation, osteitis, atrophic rhinitis, and inadequate volume reduction.[6]

The use of a microdebrider for the surgical treatment of hypertrophic turbinates was only reported by Davis and Nishioka in 1996.[1] Microdebrider-assisted inferior turbinoplasty (MAIT) may be performed intraturbinally (removal of submucosal tissue via a submucosal pocket) or extraturbinally (trimming

of the turbinate's mucosal surface) according to the volume of the submucosal tissue and surgeon's preference. However, these surgical techniques are mainly focused on mucosal volume reduction of the inferior turbinate to relieve the nasal obstruction.[6]

2 Methods

Our systematic review was done according to a protocol published in PROSPERO with identification serial number as CRD 42019126157. The methods and reporting were based on the Cochrane Collaboration and the preferred reporting items for systematic reviews and meta-analyses statement.[7] The evaluation was done according to the Grading of Recommendations Assessment, Development and Evaluation (GRADE) guidelines.[8]

2.1 Eligibility criteria

We included all the Randomised Controlled Trials (RCTs) comparing microdebrider assisted turbinoplasty versus other techniques for inferior turbinoplasty. We only included articles that are available in English. We included patients of all age groups, with any ethnicity, who presented with symptoms of nasal congestion due to inferior turbinate hypertrophy. We excluded patients with any other nasal conditions contributing to nasal obstruction and patients who have undergone other nasal or sinus surgery. Intervention is microdebrider assisted inferior turbinoplasty, either intraturbinal or extraturbinal. We included studies with a follow-up period

2.2 Search Strategy

Electronic searches

We searched the Cochrane Register of Controlled Trials CENTRAL, which includes MEDLINE (1966 to present), We then combined the MEDLINE search strategy with the Cochrane Highly Sensitive Search for identifying randomized trials in MEDLINE. We checked the reference list of identified RCTs and reviewed articles to find unpublished trials or trials not identified by electronic searches.

We also searched for ongoing trials through the World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP) http://www.who.int/ictrp/en/ and www.clinicaltrials.gov.

2.3 Study Selection

We scanned the titles and abstracts from the searches and obtained full-text articles when they appear to meet the eligibility criteria, or when there is insufficient information to assess the eligibility. We assessed the eligibility of the trials independently and documented the reasons for exclusion. We resolved any disagreement between the review authors by discussion. We contacted the authors for clarification if required.

2.4 Data extraction

Data were extracted using data collection forms. The reviewers independently extracted study settings, participant characteristics (e.g. age), methodology, and duration of the follow-up. We also extracted the method of assessment of nasal obstruction and other nasal symptoms and complication of these procedures and the recurrence.

2.5 Risk of bias assessment

We assessed the risk of bias based on random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessors, completeness of outcome data, the selectivity of outcome reporting and other bias.[7] We resolved any disagreements by discussion.

2.6 Grading quality of evidence

We assessed the quality of evidence for primary and secondary outcomes according to Grading of Recommendation, Assessment, Development and Evaluation (GRADE) methodology for risk of bias, inconsistency, indirectness, imprecision and publication bias; classified as very low, low, moderate and high.[8]

2.7 Statistical analyses

Data synthesis

We undertook meta-analyses using Review Manager 5.3.5 software (RevMan 2014) and used the random-effects model to pool data. We used the guide to interpret heterogeneity as outlined: 0% to 40% might not be important; 30% to 60% may represent moderate heterogeneity; 50% to 90% may represent substantial heterogeneity, and 75% to 100% would be considerable heterogeneity.[7]

We measured the treatment effect for dichotomous outcomes using risk ratios (RRs) and absolute risk reduction, and for continuous outcomes, we used mean differences (MDs); both with 95% confidence intervals (CIs). We conducted subgroup analyses on the short, intermediate and long term. We performed a sensitivity analysis to investigate the impact of risk of bias for sequence generation and allocation concealment of included studies.

3 Results and analysis

3.1 Study selection

We retrieved 123 records from the search of the electronic databases and one record from other sources (Figure 1). We screened a total of 43 records. We identified 25 articles as possibly meeting the review inclusion criteria. Fourteen articles were excluded, of which 11 were non-randomized clinical trials, two articles did not report the outcomes of interest,[9,10] and one article was not available in English.[11] Eleven articles were included in this review, of which 10 were analysed quantitatively. One trial evaluated, however, there was only one trial for the comparison between microdebrider and diode lase 980 nm, therefore, we were unable to pool the data for analysis. [12]

3.2 Participants

Table 1 shows the characteristics of included studies. Nine out of 11 studies were single-center studies[13-21] and two were multi-center studies. [12,22] All the studies were done in adults except for one study, which was done in the pediatrics age group, between the age of 9-14 years with the mean age 11.6 years.[22]

3.3 Intervention

Six studies used compared microdebrider technique with radiofrequency ablation,[13,17-21] and four studies compared with submucosal resection.[14-16,22] Only one study compared microdebrider technique to 980 nm diode laser.[12] The microdebrider assisted turbinoplasty was done under local anesthesia in seven studies,[13,15-21] and three studies, the procedure was under general anesthesia.[12,14,22] One study did not mention the type of anesthesia used.[16] Nine microdebrider assisted turbinoplasty was done intraturbinally[12,13,15-17,19-22] and two studies was done extraturbinally.[14,18]

3.4 Outcomes

Primary outcome

Relief in nasal obstruction was measured subjectively via Visual Analogue Score and Subjective Nasal Obstruction Scale and objectively via acoustic rhinometry, anterior rhinomanometry, mucociliary transport time and turbinate edema measurement. All six studies that compared microdebrider and radiofrequency reported that they had measured the relief in nasal obstruction. Five studies measured nasal obstruction using Visual Analogue Score.[13,17-19,21] and one study measured using Subjective Nasal Obstruction Score.[20] However, one study did not report the values.[17] Three studies measured nasal obstruction using mucociliary transport time.[13,17,19] Four studies measured the nasal obstruction using acoustic rhinometry.[13,18-20]All four studies that compared microdebrider and submucosal resection reported the measurement in relieving of nasal obstruction using Visual Analogue Score.[14-16,22] Two studies also measured the primary outcome objectively using mean total nasal resistance. [16,22] The study that compared microdebrider with laser has measured relief in nasal obstruction Visual Analogue Score and objectively using mean total nasal.[12]

Four out of the six studies that compared microdebrider and radiofrequency has reported the complications related to the procedure.[13,17,18,21] Four studies mentioned the improvement in other nasal symptoms.[13,18,19,21] Two studies have mentioned the duration of operation.[18,21] Two studies have reported recurrence.[17,21] All four studies comparing microdebrider and submucosal resection have reported on complications related to the procedure[14-16,22] Two studies mentioned the improvement in other nasal symptoms.[15,22] Two studies have mentioned the duration of operation.[14,16] The study comparing microdebrider versus diode laser reported crusting post-operation but did not mention the values. This study also mentioned the duration of operation and amount of blood loss but did not report the values.[12]

3.5 Risk of bias in included studies

The assessment of the risk of bias is shown in Figure 2 and Figure 3. Figure 2 shows the proportion of studies assessed as low, high, or unclear risk of bias for each risk of bias indicator. Figure 3 shows the risk of bias indicators for individual studies. The details of these trials are found in the table of Characteristics of included studies.

Allocation

Six trials described the method of randomization used. Two of the trials described the randomized. [13,12] and was judged as low risk. Another four studies mentioned that the participants were randomized but did not mention the method of randomization.[14,15,17,22] The method of randomization was not reported in the other five trials and, thus, we judged random sequence generation as unclear risk of bias.[16,18-21] Allocation concealment was mentioned in two of the studies[12,14] but was unclear in nine studies.[13,15-22]

Blinding

Eight trials were done under local anesthesia and was classified as high risk of bias.[12,13,15,17-21] One of the articles did not mention if the procedures were done under local or general anesthesia and was described as unclear risk of bias.[16] Two of the articles were done under general anesthesia, but blinding was not described in one of the articles and was classified as unclear.[22] The other article mentioned that the patients were blinded to the methods used and was classified as low risk of bias.[14]

Incomplete outcome data

All 11 articles measured the primary outcomes and were included in the meta-analysis. All articles have described the primary outcomes. Nine articles measured the primary outcome in two to 12

months[12-14,16-18,20-22] with no loss of follow-up. Two other articles measured outcomes for up to 3 years.[15,19] These two articles had less than 20% loss to follow-up.

Selective reporting

The protocol for all the studies was not provided; however, all the 11 trials reported the outcomes specified in their respective methodology and was judged as low bias for selective reporting.

Other potential sources of bias

We detected no other potential sources of bias.

3.6 Comparisons and effects of interventions

3.6.1 Reduction of nasal obstruction

All six trials that compared microdebrider and radiofrequency reported the outcome of reduction of nasal obstruction. This was assessed based on Visual Analogue Scale, Subjective Nasal Obstruction Score, mean total nasal resistance and mucociliary transport time.

Four trials measured the reduction of nasal obstruction subjectively using continous data.[13,18-20] There is a reduction in symptoms of nasal obstruction in the microdebrider group (SMD -0.58, 95% CI -1.01 to -0.15; P=0.008, I^2=76%; 4 studies, 400 patients, moderate quality evidence) (Figure 4). Subgroup analysis based on the duration of 1 month showed a reduction in symptoms of nasal obstruction in the microdebrider group (SMD -1.13, 95% CI -1.73 to -0.53; P<0.001, I^2=36%; 2 studies, 80 patients, moderate quality evidence) (Figure 4). However, there was no significant difference in the reduction of nasal obstruction the intermediate term of 3 months and the long term of more than 6 months.

Two other studies had non-usable data but mentioned that there was a significant difference in the relief of nasal obstruction post-operation when compared to pre-operation in both the microdebrider and radiofrequency groups.[17,21]

Three trials measured reduction in nasal obstruction using mucociliary transport time.[1,17,19] There was no difference in the reduction of nasal obstruction between microdebrider and radiofrequency based on mucociliary transport time (MD -0.34, 95% CI -1.18 to 0.49; P=0.90, I^2=0%; 3 studies, 220 patients, moderate quality evidence) (Figure 5).

Four studies reported a reduction in nasal obstruction measured using Acoustic Rhinometry and Anterior Rhinomanometry.[13,18-21] There is no significant reduction in nasal obstruction between the microdebrider and radiofrequency groups (SMD 0.35, 95% CI -0.12 to 0.82; P=0.0003, I^2=78%; 6 studies, 360 patients, low quality evidence) (Figure 6).

All four trials that compared microdebrider and submucosal resection reported relief in nasal obstruction using the Visual Analogue Scale.[14-16,22] Two of the studies were in continuous data.[15,22] There is no difference between both groups (MD -0.10, 95% CI -0.36 to 0.15; P=0.13, I^2=57%; 2 studies, 280 patients, low quality evidence) (Figure 7).
The other two studies were in dichotomous data.[14,16] There is also no difference between the groups (RR 0.98, 95% CI 0.89 to 1.08; P=0.74, I^2=74; 2 studies, 106 patients, moderate quality evidence) (Figure 7).

One study compared microdebrider with diode laser reported a reduction in nasal obstruction based on the Visual Analogue Scale score.[12] There is no difference between both the groups (RR 1.13, 95% CI 0.83 to 1.55; P= 0.43, 1 study, 40 patients). Assessment in the reduction of nasal obstruction with acoustic rhinometry reported no difference between the two groups (MD 0.10, 95% CI -0.13 to 0.51; P=0.64, 1 study, 40 patients).

Secondary Outcome

Reduction in nasal discharge

Two trials comparing microdebrider and radiofrequency reported no difference in the reduction of nasal discharge based on the Visual Analogue Scale score.[13,19] between the two groups (MD -0.11, 95% CI -0.46 to 0.24; P=0.31, I^2= 4%; 2 studies, 160 patients, moderate quality evidence) (Figure 8).

Two trials that compared microdebrider and the submucosal resection reported no difference in the reduction of nasal discharge based on the Visual Analogue Scale score[15,22] between the two groups (MD 0.02, 95% CI -0.13 to 0.17; P=0.55, I^2=0%; 2 studies, 280 patients, moderate quality evidence) (Figure 9).

Reduction in sneezing

Two trials comparing microdebrider and radiofrequency reported no difference in the reduction of sneezing based on Visual Analogue Scale score[13,19] between the two groups (MD -0.14, 95% CI -0.45 to 0.17; P=0.87, I^2= 0%; 2 studies, 160 patients, moderate quality evidence) (Figure 10).

Two trials that comparing microdebrider and submucosal resection reported no difference in the reduction of sneezing based on the Visual Analogue Scale score[15,22] between the two groups (MD -0.14, 95% CI -0.36 to 0.07; P=0.96, I^2=0%; 2 studies, 280 patients, moderate quality evidence) (Figure 11).

Reduction of snoring

Two trials comparing microdebrider and radiofrequency reported no difference in the reduction in snoring based on Visual Analogue Scale score[13-19] between the two groups (MD -0.07, 95% CI -0.35 to 0.22; P=0.31, I^2= 4%; 2 studies, 160 patients, moderate quality evidence) (Figure 12).

Two trials comparing microdebrider and submucosal resection reported no difference in the reduction of snoring based on Visual Analogue Scale score[15-22] between the two groups (MD -0.10, 95% CI -0.26 to 0.06; P=0.63, I^2=0%; 2 studies, 280 patients, moderate quality evidence) (Figure 13).

Reduction in Headache

One trial comparing microdebrider and radiofrequency that reported the symptoms of headache based on Visual Analogue Scale score.[13] There is no significant difference between the two groups (MD -0.96, 95% CI -1.97 to 0.05; P=0.06; 1 study, 40 patients).

Reduction of post nasal drip

One trial comparing microdebrider and radiofrequency reported no difference in the reduction of postnasal drip based on Visual Analogue Scale score[13] (MD 0.72, 95% CI -0.63 to 2.07; P=0.30; 1 study, 40 patients).

Reduction of hyposmia

One trial comparing microdebrider and submucosal resection reported no difference in the reduction of hyposmia based on Visual Analogue Scale score[22] (MD -0.05, 95% CI -0.35 to 0.25; P=0.75; 1 study, 120 patients).

Complication

Hemorrhage

The microdebrider versus radiofrequency comparison showed an increase in the incidence of hemorrhage in the microdebrider group[17,18] (RR 4.20, 95% CI 1.09 to 16.18; P=0.90, I^2=0%; 2 studies, 240 patients, moderate quality of evidence) (Figure 14)

Two trials comparing microdebrider and submucosal resection reported no difference in the incidence of hemorrhage as a complication[14,15] between the two groups (RR 0.20, 95% CI 0.01 to 4.00; P=0.29; 2 studies, 220 patients, low quality evidence) (Figure 15).

Crusting

One trial comparing microdebrider and radiofrequency reported no difference in the incidence of crusting as a complication[13] (RR 2.00, 95% CI 0.20 to 20.33; P=0.56; 1 studies, 40 patients).

Three trials comparing microdebrider and submucosal resection reported the reduction of crusting in the microdebrider group[14-16] (RR 0.29, 95% CI 0.1 to 0.77; P=0.10, I^2=63%; 3 studies, 266 patients, low quality evidence) (Figure 16).

Mucosal Tear

One trial comparing microdebrider and radiofrequency reported an increase in the incidence of mucosal tear in the microdebrider group[17] (RR 29.00, 95% CI 1.81 to 465.07; P=0.02; 1 studies, 60 patients). One trial comparing microdebrider and submucosal resection reported reduction in the incidence of mucosal tear in the microdebrider group[15] (RR 0.25, 95% CI 0.12 to 0.51; P<0.001; 1 studies, 160 patients).

Synechia

One trial comparing microdebrider and radiofrequency reported no difference in the incidence of synechia[17] (RR 5.00, 95% CI 0.25 to 99.95; P=0.29; 1 studies, 60 patients).

Two trials comparing microdebrider and submucosal resection[14,15] (Badran 2011, Chen 2008) but only one study reported the incidence of synechia[15] (RR 0.20, 95% CI 0.01 to 4.10; P=0.30; 1 study, 160 patients).

Atrophic rhinitis

Two studies that compared microdebrider and submucosal resection reported no incidence of atrophic rhinitis.[14,15]

Pain

One study comparing microdebrider and submucosal resection reported no difference in the incidence of post operative pain[16](MD -0.90, 95% CI -2.17 to 0.37; P=0.17, 1 study, 46 patients).

Recurrence

Two studies comparing microdebrider and radiofrequency reported no difference in the incidence of recurrence[17,21] between the groups (RR 0.33, 95% CI 0.08 to 1.33; P=0.45, I^2=0%; 2 studies, 120 patients, moderate quality evidence) (Figure 17).

Duration of operation

Two studies comparing microdebrider and radiofrequency have reported no difference in the duration of operation[18,21] between the groups (MD 7.5, 95% CI -6.41 to 21.42; P<0.001, I^2=100%; 2 studies, 120 patients, low quality evidence) (Figure 18).

Two studies comparing microdebrider and submucosal resection reported that the duration of the operation in reduced in the microdebrider group[14,16] between the groups (MD -12.59, 95% CI -23.7 to -1.48; P< 0.001, I^2= 99%; 2 studies, 106 patients, low quality evidence) (Figure 19).

Intraoperative blood loss

One study comparing microdebrider and submucosal resection reported there is reduced intraoperative blood loss in the microdebrider group[16] (MD -10.70, 95% CI -15.62 to -5.78; P< 0.001; 1 studies, 46 patients).